School Shop

FOR INDUSTRIAL ARTS & VOCATIONAL EDUCATION TEACHERS

vol. IV No. 2

October, 1944

Good Shop Teaching in Three Hard Lessons
by Arthur B. Mays

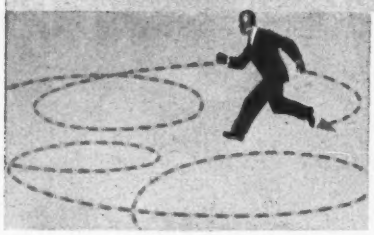
Comparator
by Jon P. Adams and M. B. Goodwin

"Electronicise" Your Electricity Course
by Ralph O. Williams

Films Make Good Teaching Better
by G. H. Fern and E. Robbins

On the cover: The good shop teacher must know how pupils learn and how to present new material so learning will occur, writes A. B. Mays. How do you rate as a shop teacher? Turn to page 5 for the rules of good teaching.

THREE CAUSES OF EYE FATIGUE IN WORKERS



UNNECESSARY TRAVEL—Eyes have a habit of wandering. On a long monotone machine, the eye covers a great deal of unnecessary distance because there's nothing to hold it at one spot. Just as wasted steps tire out the body, so this needless travel which accomplishes nothing, tires out the eye.

TENSION—Hold out your arm, tensing the muscles. Notice how quickly they grow weary. The same thing happens to a worker's eyes when material he is fabricating is too similar in color to his machine. Wasted effort is required to differentiate between material and machine.

CONSTANT ADJUSTING—Go from a sunlit street into a moving-picture theater. For a minute you are so blind that you have difficulty finding a seat. A worker who glances up from a light-colored machine to a dark wall (or vice versa) has the same experience to a lesser degree.

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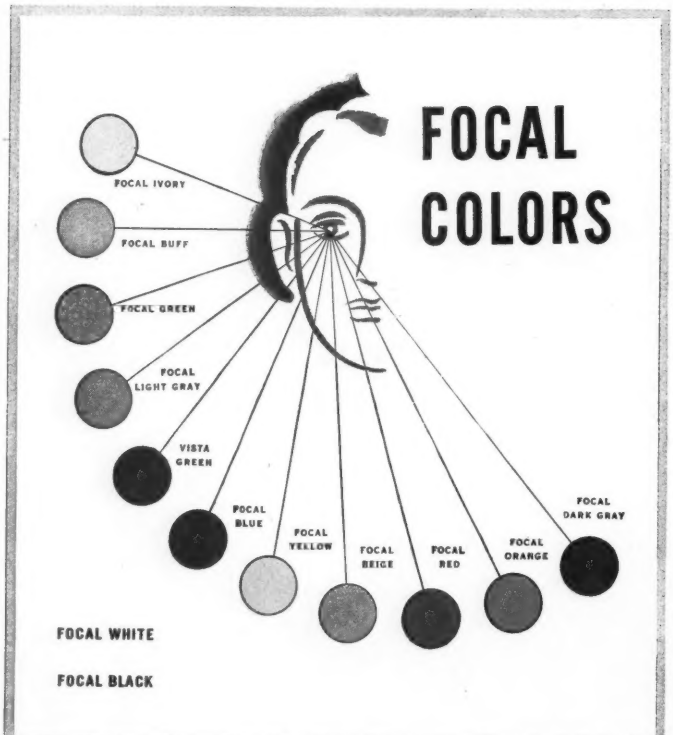
A new system of using color to minimize workers' eye fatigue which will interest all teachers in trade or industrial schools.



• No matter what type or color of material a given machine is processing, one of these focal colors will provide a satisfactory contrast with it. Applied to the operating parts of the machine, this focal color reduces strain, eye-fatigue and accidents.

THERE is a tendency to forget that people work not only with their hands, *but also with their eyes*—and that the seven muscles which operate the movements of the eyeball get tired just like arm or leg muscles.

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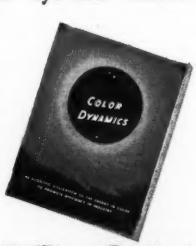

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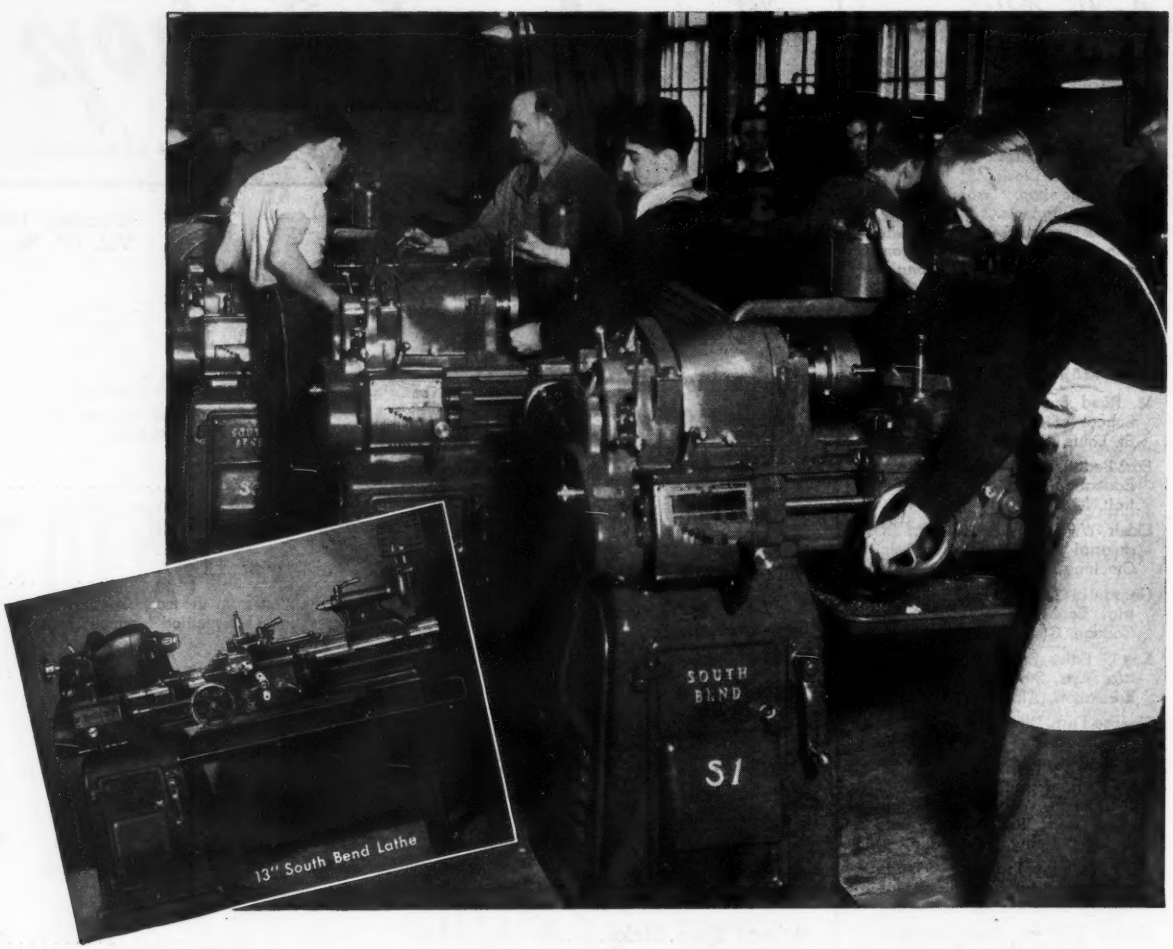
SOUTH BEND LATHES



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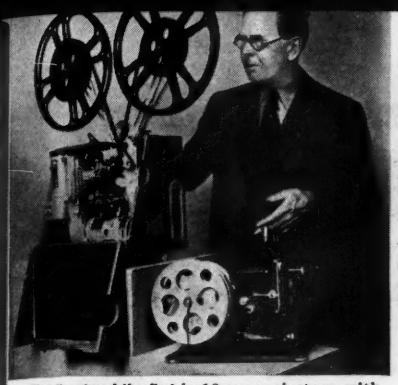

The finest and the first in 16mm projectors, with their designer, Alexander F. Victor, whose inventions and improvements over the past 21 years have bridged the gap between the first Victor Ciné Projector (right) and the new Victor Animatophone (left).

International Relations: "After the war we have all got to learn to live together . . . we can't all travel around the world to learn to understand each other . . . we can do it through 16mm film better than any other way," said C. R. Reagan, director, non-theatrical division, Bureau of Motion Pictures, Office of War Information.

Better Education: "This medium of communica- tion makes possible . to bring the truth t millions upon whom depends the realizatio of our democratic goals," declared Dr. Clyd V Arnspiger, vice president of Encyclopedi Britannica Films, Inc.

16mm BECOMES OF AGE

21 years old August 12, 1944; Born August 12, 1923

NOW 21 YEARS OLD, has the 16mm industry reached its full growth? Are there new horizons of achievement before it?" The answer was given by leaders of education, business, industry, and government as they honored Alexander F. Victor, designer and producer of the first 16mm camera and equipment. The magic of 16mm sight, sound and sequence has already transformed methods of teaching, training, selling and entertainment. But as 16mm Comes of Age, its future will even overshadow its brilliant present. Almost every field of endeavor in every corner of the world will look to Victor who first brought 16mm into being to provide the 16mm camera and projector of tomorrow.

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Twenty-one years ago the first 16mm cameras, pr jectors and films in the world were announced this full page newspaper advertisement whic A. F. Victor, president, and S. G. Rose, exec tive vice president of Victor Animatograph Co poration are re-reading as the 16mm industr comes of age.

First in the fight for a safety standard for no theatrical film and equipment, first to design an produce 16mm cameras and projectors, A. Victor responds to the tributes paid him b leaders in education, business, industry an government.

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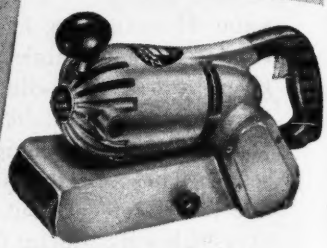

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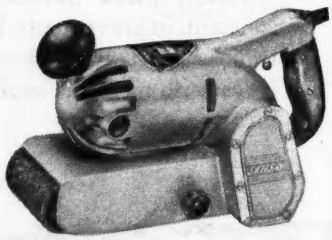

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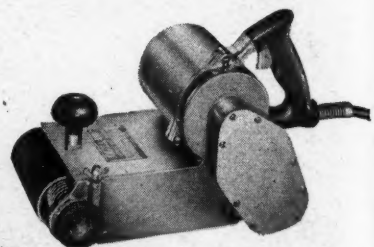

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Good Shop Teaching in Three Hard Lessons

BY *Arthur B. Mays*

Arthur B. Mays, Professor of Industrial Education at the University of Illinois, has cut through much educational research to reveal basic factors of success in shop teaching. Here are conclusions that master teachers in all branches of learning recognize as the ultimate tests for happy and successful teaching.

THE three basic factors of success in industrial teaching, wrote the late Professor Robert W. Selvidge, are: (1) what the teacher must know, (2) what the teacher must be able to do, and (3) what the teacher must be. When each of these basic factors is analyzed into essential items expressed in definable terms, a fairly simple and practicable method of determining success factors results. One may with reasonable assurance select and counsel teachers on this basis, and the conscientious teacher may, with attention to these factors, improve his teaching and assure his success.

What the Teacher Must Know and How He Must Know It

All will agree that the first requisite of successful shop teaching is that the teacher must know thoroughly what he tries to teach. Mastery of subject matter lies at the base of all good teaching. Nothing destroys pupil respect for the instructor more surely and more rapidly than the discovery that he does not thoroughly know the material he is presenting. Mastery of subject matter is within the power of any teacher. It requires of him a genuine interest, an insatiable curiosity, and a persistent desire to know. This merely means that the successful teacher must be a real student. A discerning administrator can easily determine within a few minutes of conversation with a teacher whether he is a real and persistent student of his field of work. Too few shop teachers are such students of their work.

The teacher must not only know his subject matter but he must know how to organize it into suitable form for successful instruction. Much study and experimentation have been devoted to the technics of analysis and organization of instructional materials and the successful teacher should know all the several procedures and how to choose the most appropriate for a given set of conditions. Intelligent course-making is based upon sound educational principles and the various means of applying them in course construction.

To know subject matter and how to organize it for instructional purposes is still not enough knowledge for successful teaching. The shop teacher must thoroughly understand the psychological and pedagogical bases of learning and teaching. A general course in psychology during one's teacher-training experience will not provide this knowledge, nor will a course in methods or educational psychology which the prospective teacher only half understood provide this knowledge. To be thoroughly successful, the shop teacher must really *know* how pupils learn and know how to present new material so learning will occur. Such knowledge will rarely be acquired during the teacher-training part of one's career. It grows as the teacher continues to study both his professional literature, year by year, and his pupils day by day.

One other area of knowledge the shop teacher must have, namely, what is happening in the world he is trying to prepare his pupils to enter and succeed in. Particularly must he know much, and constantly more, about modern industry. This means he must maintain contact with industry. One of the most attractive features of shop teaching is that its subject matter is concerned with today and tomorrow and only incidentally with yesterday. The successful shop teacher is therefore obligated to know the new materials, new methods, and new trends of industry.

How must the teacher know what he knows? He must know it so thoroughly that he can use his knowledge. So to know is to understand the *meaning* of what he knows in terms of its use. There are scholars in the world who know so much that one feels about them as did Goldsmith's villagers as they listened to their schoolmaster argue with the parson.

While words of learned length and thundering sound
Amazed the gazing rustics ranged around;
And still they gazed, and still the wonder grew,
That one small head could carry all he knew.

But, alas, too often such scholars do not seem to understand what it all means in terms of life today. The successful teacher is concerned with helping boys live life effectively today with the end in view of living it better tomorrow. Hence he must possess his knowledge in terms of its meaning and use. Once more, this means constant study year by year throughout one's professional career.

What the Shop Teacher Must Be Able to Do

The shop teacher must be able to do

All successful teachers have ability to inspire pupils. It is probable that the basis of this power is genuine interest in the thing being taught, in the pupils, and in teaching.

How Do You Rate As a Shop Teacher?

1. A teacher must know thoroughly what he tries to teach.
2. He must know all successful schemes of course instruction and be able to use them all.
3. He must know how pupils learn and know how to present new material so learning will occur.
4. He must know much, and constantly more, about modern industry. He must know the new materials, new methods, the new trends in industry.
5. He must know what he knows in terms of its meaning and use.
6. He must be able to do skillfully all the processes he tries to teach his pupils to do.
7. He must be able to interest and inspire pupils.
8. He must have administrative skill to organize and direct group activities with a minimum of delay and confusion.
9. He must be able to work with other teachers of his school and under the authority of school officials.
10. He must be a good leader and a good citizen. Pupils are never quite able completely to segregate what a teacher knows and is able to do from what they believe him to be as a man and member of the community.

skillfully all the processes he tries to teach his pupils to do. If he fails here, all his knowledge is of little avail. He is respected by youth most for what he can do, and after that for what he knows. As one grows older he increasingly admires knowledge in others but in youth homage is given first to skill. The highest compliment a boy pays to his shop teacher is, "I wish I could do that the way you do it." To be skillful one must study skill and practice constantly. Shop pupils learn how to do by watching a master perform and by trying to imitate him successfully. This comes first.

Next in order is the ability to interest and inspire pupils. Different men do this successfully in very different ways, depending on their varying personalities, but all successful teachers have this ability. It is probable that the basis of this power is genuine interest in the thing being taught, in the pupils, and in teaching. It is not likely that pupils will be more interested than the teacher is. Dodge in his very careful study of teaching success found that, "A significant relationship was found to exist between teacher personality scores and . . . expressed liking for teaching."* It appears that ability to interest pupils is conditioned by the teacher's attitude toward his work and his interest in what he teaches and in his pupils.

The successful shop teacher must also be able to organize and direct group activities with a minimum of delay and confusion and a maximum of orderliness and efficiency. This means, in a word, he must be able to plan and direct with skill and efficiency. Shop teaching calls for administrative and executive ability as does no other type of school teaching. The whole range of activities such as: budget making, planning, record keeping, class organization, maintenance of appropriate discipline, good "housekeeping," enforcement of safety rules, and all the other characteristic duties of shop teaching must be executed with genuine skill. The acquiring of skill always involves concentration and practice, and the administrative skills of the shop teacher are developed in precisely the same manner as are all other skills.

Furthermore the successful shop teacher must be able to work with the other teachers of his school and under the authority of school officials. Many fail at this point. The ability to work successfully as part of an organization requires study and practice. It involves one's attitudes toward life and one's fellows but chiefly one's scale of values. What is really important in a given situation and what is relatively trivial? Skill in weighing the relative importance of the elements of a situation determines in large measure one's ability to work with others. Since training in this important ability is one of the aims in all vocational success, it ranks high as a teaching ability. The shop teacher who cannot work successfully with his colleagues and those over him in authority can have little hope of training his pupils in this important skill.

*Arthur F. Dodge, "What Are the Personality Traits of the Successful Teacher?" *Journal of Applied Psychology*, XXVII:4 (August, 1943), 337.

A teacher is respected by youth most for what he can do, and after that for what he knows. The highest compliment a boy pays to his shop teacher is, "I wish I could do that the way you do it."

What the Shop Teacher Must Be

What a teacher knows and what he is able to do have much to do with what he is. They color when they do not completely control what he is. There are, however, certain broad, basic qualities that he must possess. Perhaps first in importance, he must be a real teacher. That means he must be devoted to teaching, proud of his vocation, keenly aware of his obligation to society and to his pupils because of his being a teacher; and he must be deeply interested in becoming a better teacher. To be a real teacher also means to feel a heavy obligation to be a leader. It is burdensome to be a leader. One is never free to do as he pleases, if he be a real leader. People watch a leader. What he says and does are noted and told to others. Nor can a leader drop his position of leadership when the day's work is over. Indeed, he is sometimes watched more closely after work hours than while teaching. Some men resent this aspect of teaching, but it merely indicates the social importance of the vocation, and to be successful they must, as fully as possible, live up to their obligations of leadership.

To be a real teacher, one must also be a good citizen, with all that implies. Pupils are never quite able completely to segregate what a teacher knows and is able to do from what they believe him to be as a man and member of the community. Some very scholarly men have tried to argue that they are paid for what they know and it is no one's business what they are. In the very nature of teaching this cannot be true. One is never paid merely for what he knows and can do. How difficult it is for some to learn this! The intimate relationship of the shop teacher with his pupils makes extremely important what sort of person he is.

The successful shop teacher must be a thorough and persistent student of his work, of his pupils, of industry, and of the major factors of the era in which he is a leader. His field is a vital element in modern life. What he teaches and the way he does it will have far-reaching effects whether he realizes it fully or not. To be successful he must know not only what he is doing, but why he is doing it, and, in addition, something of the larger social and economic meanings. Only constant study will enable him to be what he is expected to be and bring to him the full measure of understanding and happiness which are his proper reward. Lasting success comes only to the teacher who is a thorough student of his profession and of the life toward which he would guide his pupils.

The training film used in the shop helps to visualize detailed operations. Here, students at Rochester Athenaeum and Mechanics Institute are viewing a motion picture on lathe operation. As soon as the showing is complete, students turn to their work while impressions are still vivid.

Films Make Good Teaching Better

BY *George H. Fern and Eldon Robbins*

ALTHOUGH there is considerable evidence to prove that effective use of teaching films increases learning, there is less certainty as to what constitutes "effective use" of teaching films. Certainly it is not measured in terms of the number of films shown to the class. Merely showing pictures is not teaching with films.

Films are tools for instruction and like other tools may require different procedures in the performance of different operations. There are, however, certain fundamental practices and some of these principles of teaching with films follow.

Always preview.—Preview the film before showing it to your class. You wouldn't use a textbook unless you had at least skimmed through it. As you preview, make notes, so that you can direct the attention of the class to what you consider a scene of more than usual importance. Or, you may disagree with some portion of the film. Point this out while it is being shown, or make a note to discuss it later.

Use the manuals.—When an instructor's guide or manual accompanies a teaching film, it is to your advantage to make use of this material. It has been prepared to make it easier for you to do a better job of teaching. While it is not intended that you follow the instructor's manual literally, you should adapt the material to the class needs and make use of that which applies.

Clean the plugs thoroughly on a recommended cleaner. The electrodes should be free of carbon and oxide, and the porcelain should be white. Be sure the plugs are the proper type for the engine being worked on.

September SCHOOL SHOP published "Visual Aids in the Shop," by Earl Bedell, Director of Vocational Education of the Detroit Public Schools. This article gives additional instruction on how training films are most effectively used. George H. Fern is director of the Michigan State Board of Control for Vocational Education. Eldon Robbins is supervisor of the board's Audio-Visual Aids Service.

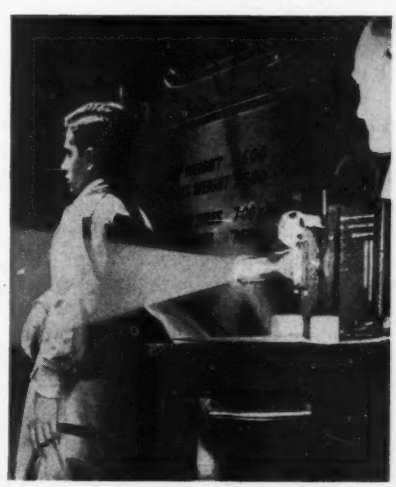
Plan your instruction.—Each step in your procedure should be planned in advance. Decide how you will introduce the film to best correlate it with the lesson. Look for ways to vary the presentation of the film to increase its effectiveness. Plan your follow-up discussion.

Prepare for the showing.—Don't handicap a teaching film by poor showmanship. The projection room should be one that can be darkened quickly. The projector should be threaded and focussed on the screen. A few minutes before showing the film, the amplifier tubes should be warmed up. The operator brings the sound up smoothly at the start and does not "blast" the ears of the listeners with sound volume at maximum level. The room should be well ventilated and not too warm.

Introduce the film.—The class is to see the film for a purpose, so make certain each member understands what that purpose is. Some instructors prepare their class to see a film by giving a short synopsis of the content and suggesting that key points be observed. Others develop a learning situation by quizzing the class about key points to be seen in the film and present the film as a source of information on these points. If a quiz is to follow the film, it may be advisable to inform the class of this. A few minutes of well planned preparation aids the learning process.

Show the film.—As a general rule, a teaching film is presented in its entirety at the first showing. If it is a discussion slidefilm, the captions are read aloud and discussion is encouraged at the reshowing of the film. Several devices may be used to vary presentation following the first showing. A motion picture can be presented by sections. If it is a sound film, the sound can be turned off and members of the group may be asked to describe the action. Only key pictures in a slidefilm can be selected for discussion. Students and instructor can and should participate during the showing as much as possible.

(Continued on page 31)

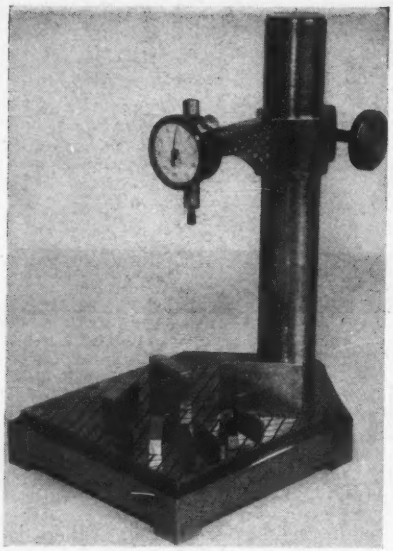


The slide film can be used in correcting faults of students right on the job. Here an instructor is showing a Jam Handy film from equipment set up next to the truck on which repairs are being made.

Comparator

BY *Jon P. Adams*
AND *M. B. Goodwin*

The comparator is the fifth in a series of projects designed and constructed in the machine shop of Proviso Township High School, Maywood, Illinois, under the supervision of the authors who are teachers there.



TESTED PROJECT

WE are fortunate to teach in a shop which is modern enough to have a regular comparator; however, a need was felt for one that could be used by the students. The factory job is used only for extremely accurate checking of less than .0001". This product of our shop is accurate to .0001".

The drawings show the construction of the stand only. The indicator used is a Federal C-21 which reads to .0001". Any indicator may be used on the comparator providing the bracket holding the indicator is modified.

When using the comparator the size to be checked is first set up with gauge blocks. For example, if a 1" plug gauge is to be checked, a 1" gauge block is selected. The arm holding the indicator is then adjusted so that the indicator is bearing on the block and the hand is in a vertical position. The final adjustment is made on the indicator by means of a rotary dial. The dial is rotated so that the zero is directly under the hand. The block is then removed and replaced to recheck the reading.

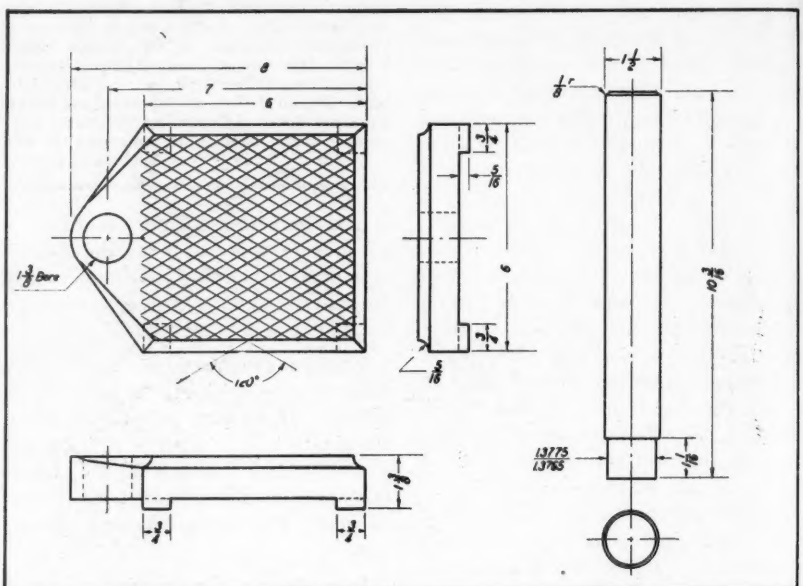
When these adjustments are completed the instrument is ready to use. The plug gauge is now carefully placed under the indicator with a rolling motion. Any deviation from the 1" standard established by the gauge block will be read directly on the dial of the indicator. The error usually found in "mike" readings is eliminated because the pressure is the same on the gauge block as it is on the piece being checked.

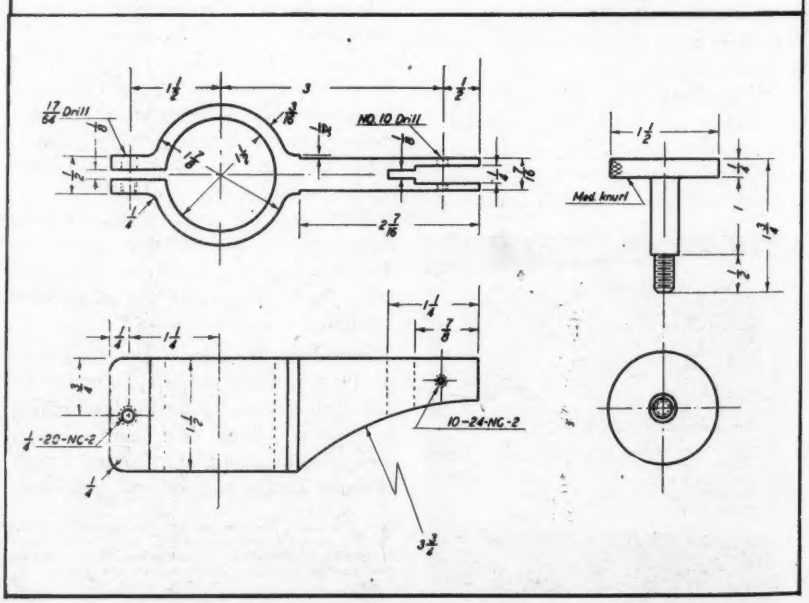
This project is simple to make. Its construction requires very little explanation. The column should have a good finish and be of a uniform diameter so that the arm will slide freely. The column of this comparator was ground on a cylindrical grinder. The lower end of the column is made to the size indicated for a press fit in the base.

The base offers the student many problems in milling. The lower side may be shaped or milled. The $\frac{5}{16}$" radius edge is milled with a $\frac{5}{16}$" radius cutter. Note: the radius does not go all the way around the column. The grooves in the base are cut with a 60° inclusive cutter.

The bracket or arm holding the indicator was cut on a contour saw. If a contour saw is not available, a shaper may be used to form the arm. The $1\frac{1}{2}$" hole in the bracket must be accurately finished, preferably by grinding, for a sliding fit on the post.

The base is pack hardened for about eight hours; then all surfaces are polished and, finally, the top is ground. The grinding is done wet so that the accuracy is not impaired by distortion due to heat generated by dry grinding.





"Electronicise" Your Electricity Course

Here electronics prevents industrial accidents. Phototubes protect the operators of huge punch and shearing machines. If a finger touches the beam of light, machines stop instantly, thus saving fingers and hands.

BY

Ralph O. Williams

When Dr. Lee de Forest in 1906 added the grid to the diode tube, thus providing a means for controlling the electron flow, the foundation for the great new electronics industry was firmly set. The war has given it a great impetus, and the demand for electronics service men is seen as increasing. Local electricians are being confronted with entirely new sets of apparatus, and they are turning to the school shop courses for assistance. Ralph O. Williams, of the Vocational Aviation Mechanics Department, Western Michigan College of Education, Kalamazoo, Michigan, indicates in this article the wide fields which electronics has already invaded and gives a practical suggestion for extending the shop course in electricity to electronics. Photographs accompanying this article are from Westinghouse Electric and Mfg. Co.

THE age of electronics, farther advanced than technicians and laymen realize, is demanding of teachers of radio and electricity, electricians, radio service men, foremen, and manufacturers that they equip themselves with electronic information and experience. In the field of communication equipment—radio receivers and transmitters, telephone circuits, etc.—there is sufficient practical knowledge for servicing. But communications is only a small part of the total use of electron tubes and circuits. Foods are dehydrated, airplanes are flown with automatic (electron-controlled) pilots, and high-speed streamlined trains are protected through the use of electronic control apparatus. And each day more automatic controls are installed. Rotating machinery is being replaced with high current rectifiers, induction heating is replacing the gas furnace, industrial processes, such as glue drying to mention one, are being reduced from hours to minutes.

At present, this modern industrial equipment is installed by service men now generally connected with the manufacturers of such equipment. All goes well with the system of remote servicing until something happens to the nerve centers of the electronic controls. Then what? Production awaits the coming of the factory service men. There is even now a pressing need for local electronics service men in every industrial area, large and small.

Consider the extensiveness of the field. We might say, for all practical purposes, that any device employing vacuum tubes in any form, protecting, controlling, or working in industry, would be classed as an application of electronics. Here is a partial list of the applications of electron tubes to manufacturing, radio broadcasting, aids to navigation, communications, and in other fields. Incomplete as it is, it serves to indicate the extensive uses to which electronics is being put: welding, welding timers, diathermy, X-ray, induction heating, electron microscopes, counters, color sorters, power converters, constant voltage sources, geophysical prospecting, radio transmitters, brazing, radio receivers, soldering, carrier current transmitters, magnetic chucks, carrier current receivers, fluorescent lighting, carrier current relays, plywood drying, location of cable faults, traffic signals, control of phase angle, insulation tests, flaw detectors, location of breaks in pipes, thermo-controls, frequency conversion, alternator controls, electrolytic processing, electronic switches, mechanical movement recorders, bearing noise testers, robot pilots, radio-photos, television, wire-photos, cathode-ray oscilloscopes, facsimile, hearing aids, photodesitometers, motion pictures, r-l-c bridges, absolute altimeters, electronic voltmeters, radar, stroboscopes, surface

Electronics . . .
(from page 9)

Should the slightest pinhole—even as small or smaller than 1/64 of an inch appear in this tin plate running through a shearing line at the rate of 1,000 feet a minute, the light shining through it shoots an impulse through the phototube, which is magnified by an amplifier, and immediately marks and classifies the defect. The pinhole detector used at the control desk here shown is illustrated on page 12.

Before electronics, it took days to bond unusually thick plywood. Here seven layers are being put in the press through which high frequency induction heat is generated by vacuum tube oscillators. The oscillators, essentially the same type used in radio transmitters, develop uniform heat throughout, actually creating heat within the work itself, and bond the plywood in minutes instead of days.

Control of machine speed is essential in many processing industries, such as in paper manufacturing here shown. Electronic voltage regulators (see page 12) function without moving parts. Corrections can be made quickly.

analyzers, vacuum tube relays, public address systems, metal locating equipment, inter-office communicators, fluid level indicators (sonic), blind landing systems, flame controllers, signal generators, smoke precipitators, audio frequency oscillators, and square-wave generators. Electronics is being applied in fields as varied as medicine, physics, geophysics, meteorology, crystallography, biology, and in many other branches of the physical sciences.

Occupational Opportunities

At present the Army, Navy, and war industries provide the bulk of employment in the electronics field. In the armed services men with a basic knowledge of electronics rise quickly to specialists ratings. In war industries electronics engineers are employed to design, to produce, and servicemen are employed to install and service equipment. With rapid conversion to peacetime production, many new pieces of apparatus will presently be offered on the market. The increased efficiency of many electronic processes and controls now perfected will rapidly be put into use in plants all over the country. This vast quantity of electronic equipment will preclude the old program of factory servicing in the field. Local electricians will, sooner or later, have to take over the job of keeping this equipment in operation.

Calamity Jane cries that the industry will be flooded with the one hundred thousand Signal Corps trained radiomen that will return from the service. *These men will not be skilled in industrial electronics.* They will have had "quickie" training courses in basic electricity and radio, but their skill will be along one line, such as radar mechanics, air-borne radioman, ground radioman, radio operator gunner, SCR-299 men, and many other specialties. Some of the best trained will return to civilian radio, but the vast majority will return to the jobs with which they are most familiar. Industrial electronics is likely to be a neglected field in the rush for economic rehabilitation unless new men are trained from the ground up for the industry.

Electronics Basis for Varied Occupations

The study of industrial electronics can lead to a variety of occupations involving the most simple to the most complex equipment. Whatever is the nature of the assignment, the qualifications for the electronics serviceman will be a thorough understanding of the basic principles of electricity and their application to electron tubes and circuits. As a consultant, he may service all equipment within an area or for a selected group of shops. He may be a manufacturer's representative and be a specialist in certain types of equipment. He might be employed as an electronics serviceman in a particular factory where one or more electronics servicemen are employed to maintain certain types of equipment for everything from intercommunication systems, to an electron microscope or a two hundred thousand ampere welder. He may be an electrician with an electronics background in a medium or small shop where his duties include installation and servicing of everything in the place, in which case he must have had an excellent training in fundamentals to enable him to cope with any situation that might arise even though he may never before have seen the equipment. Or the student of electronics may someday be an executive or shop foreman whose background in electronics will assist him to talk and listen intelligently on applied electronics with his subordinates or superiors.

Even practical considerations in human relations will prompt interest in the field of electronics. Farseeing unions can forestall now the unhappy relations that sometimes result when apprentices come equipped with new facts and new skills to work alongside long experienced men. If the experienced men had a background in electronics, they would be able to converse on equal terms with the apprentice, and if they had some opportunity to learn further the application of electronics and to become acquainted with the newer uses of electronics, they would be able to keep abreast with the changing technics in their field. By creating electronics branches in the electricians' locals, the union could do much to help the experienced men to remain good and cooperative guides to the new apprentices.

The schools can render a real service by offering the trained electricians in the community classes in applied electronics. Shop courses in electricity, now leaning heavily to wiring, conduits, and

PICTURE PAGE of Mt. Carmel's Famed Precision-el

Ever hear the story of how "precision-el" originated? It was coined by a writer who visited the Meissner plant at Mt. Carmel some time ago. He had watched in amazement as hundreds of flying fingers handled intricate and delicate assignments with unerring precision. "This," he was told, "is just a small part of Meissner's personnel . . ."

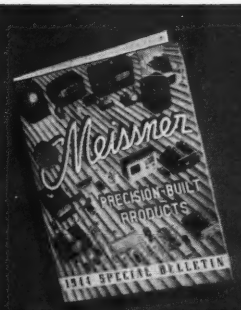
"Personnel?" he exclaimed. "Well, from what I've seen today, I'd call them 'precision-el'! No wonder Meissner has such a reputation for quality!"

Time Out! This busy worker pauses for only a fleeting second as the roving photographer snaps his picture. He does his part in making the vital and highly technical products with which Meissner supplies Allied armed forces 'round the world.

Precision-el at Work! These young women, like many Mt. Carmel residents, have literally learned the electronic business "from the ground up." They are versatile enough to handle any one of many difficult assignments.

Specialist! Mt. Carmel, Illinois, is said to have more electronic technicians per thousand population than any other city in America. This young lady is one of many experienced workers at Meissner's Mt. Carmel plant.

Veteran! Here is another reason for Meissner's top reputation for precision work. Meissner people rightly take pride in their job, in their own personal production.



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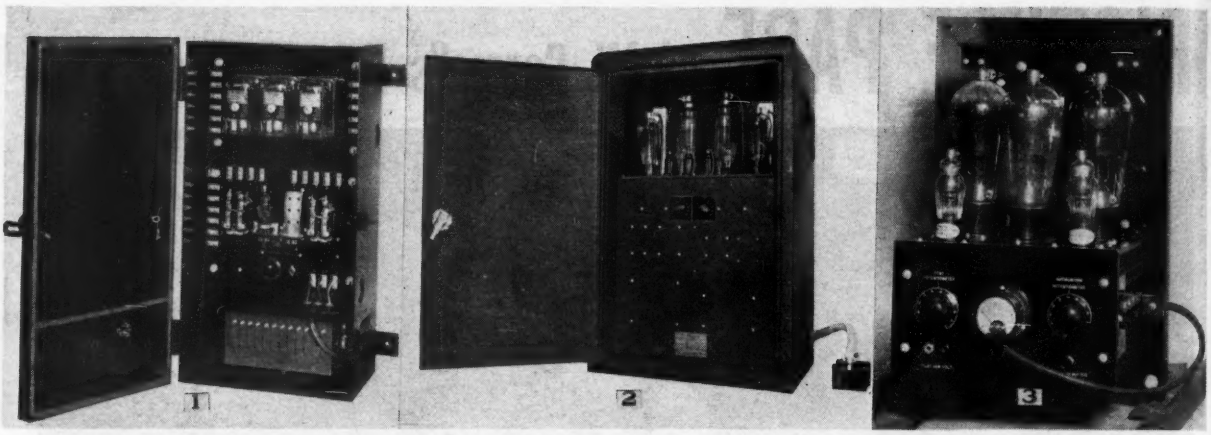

Here are three Westinghouse electric control units which employ electronics to perform specific tasks. (1) Pinhole Detector control unit (see page 10) which detects defects and marks them. This unit includes electronic tubes, time reset, and voltage regulator. (2) The Westinghouse Moto-O-Trol starts motors, brings them up to a pre-set speed, permits change of speed at any time, applies dynamic braking for stopping, and reverses the motor. (3) Constant machine speed, so essential in manufacturing where uniformity is a requirement, is now controlled through electronic voltage regulators, such as is here shown. This regulator maintains the voltage on "running" generators, despite fluctuations in power supply or changes in load.

Electronics . . . (from page 10)

rotating machinery could expand naturally to electronics. Academic courses in the theoretical aspects of electricity could supplement the study with adequate laboratory work in electronics.

Need for a Definite Program

The first job of the industrial education administrator in organizing a modern shop course in electricity is, after inventorying the instructional personnel, to determine ways and means of increasing, if necessary, the knowledge of instructors in the field of electronics. It is not wise to assume that an instructor is qualified to teach electronics because he has had a course in college physics or because he majored in mathematics and physics. Unless he has a working knowledge of vacuum tubes and circuits, alternating current and voltage phase relationships, and the knack of putting circuit components together with electrical and mechanical efficiency, a brief laboratory course in alternating currents and vacuum tubes would be required. On the other hand, the instructor should not be frightened by the apparent mystery of electronics. Since electronics is but an application of certain basic electrical principles with which any instructor, qualified to teach in the electrical shop, is familiar, it would be relatively easy for him to acquire the additional knowledge to extend his teaching to the field of electronics.

The caliber of the course depends upon the caliber of the instructor. Fine shop facilities and elaborate course outlines are of little value if the instructor lacks background and enthusiasm for the subject. A good instructor familiar with the field can make his own course outline, and with a few well-chosen pieces of equipment in addition to the existing facilities, set up an adequate electronics shop.

Course Outline

The shop course, given to industrial electronics servicemen, that is, electricians with an electronics background, need only go deep enough into mathematics and physics to give them a good general working knowledge of alternating current, vacuum tubes, and circuits. The rest of the course may consist of laboratory projects to demonstrate the application of the fundamentals to the industrial electronics field, and the construction of as many small models of commercial equipment as time and facilities permit, and, of course, experience in the use of whatever factory-made equipment is on hand. The student must be skilled in the use of the tools of the trade including test instruments.

The course outline offered here is only a suggestion (most instructors will prefer to make up their own) and may be arranged, abbreviated, annotated, and certain parts emphasized as required.

Shop Work Outline

Part I. Learn the Name, Use, and Proper Care of the Following Tools: 1. Pliers; 2. Screw drivers; 3. Tin snips; 4. Files; 5. Abrasives; 6. Grinders; 7. Hammers; 8. Drills; 9. Saws; 10. Wrenches; 11. Taps, dies, and reamers; 12. Soldering irons; 13. Measuring tools; 14. Vises.

Part II. Identification of Standard Sizes of Hardware such as: 1. Machine screws, sizes and threads per inch; 2. Selftapping screws; 3. Elastic stop-nuts; 4. Lock-washers; 5. Wire sizes; 6. Wood screws.

Part III. Nomenclature. The student must be able to recognize and name the following circuit components in their various forms: 1. Resistors; 2. Inductors; 3. Capacitors; 4. Vacuum tubes; 5. Batteries; 6. Transformers; 7. Relays; 8. Circuit breakers; 9. Fuses; 10. Switch boxes; 11. Cables; 12. Plugs; 13. Switches; 14. Electrodes; 15. Vacuum-tube sockets; 16. Motors; 17. Generators; 18. Insulators; 19. Conduits; 20. Raceways; 21. Standard R.M.A. color code for resistors and condensers.

Part IV. Shop Skills: 1. Soldering; 2. Tinning; 3. Sweating; 4. Bus bar; 5. Cabling; 6. Splicing; 7. Terminating wires; 8. Sweating on terminals; 9. Connecting to tensile wire; 10. Mountings, use of; 11. Junction boxes, connections; 12. Cord and plug assembly; 13. Bonding.

Part V. Jobs and Projects: 1. Connect d-c circuits; 2. Test truth of Ohm's Law for d-c circuits; 3. Make meter shunts; 4. Make meter multipliers; 5. Make small electromagnet; 6. Wind low-voltage transformer; 7. Construct Wheatstone's bridge; 8. Construct an Ohmmeter; 9. Mount vacuum-tube socket; 10. Wire vacuum-tube circuit for plotting tube characteristic curves; 11. Run characteristic curves on diode, triode, and pentode tubes; 12. Test neon tube for "firing" and "extinguishing" voltage; 13. Plot characteristics of type 884 thyratron; 14. Build half-wave rectifier d-c power supply; 15. Build full-wave rectifier d-c power supply with filter; 16. Connect several small transformers in series, then parallel, and check current and voltage characteristics; 17. Delta and wye connect three small transformers, as for three-phase work; 18. Use oscilloscope to show a-c wave form; 19. Build half-wave three-phase rectifier; 20. Connect small single-phase a-c motor for 110-volt operation, then for 220-volt operation; 21. Reverse direction of rotation of single-phase motor; 22. Selsyn motor experience; 23. Connect three-phase motor to line; 24. Build vacuum-tube audio-frequency oscillator; 25. Build vacuum-tube radio-frequency oscillator; 26. Connect thyratron (type 884) to d-c relay and operate from r-f on grid; 27. Build audio-frequency amplifier; 28. Build small m.o.p.a. radio-frequency transmitter; 29. Build tuned r-f radio receiver (as in interoffice communicators); 30. Align t.r.f. receiver; 31. Build wavemeter, and calibrate; 32. Measure transmitter frequency; 33. Demonstrate loss of

(Continued on page 16)

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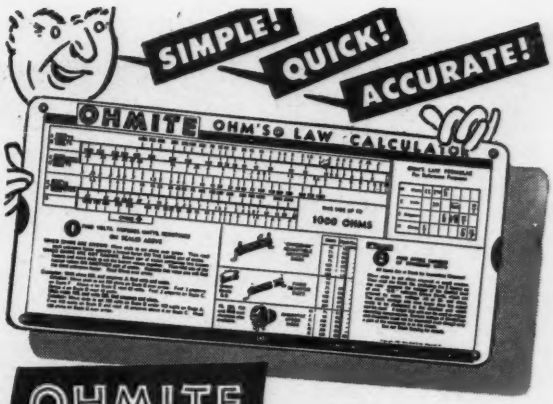

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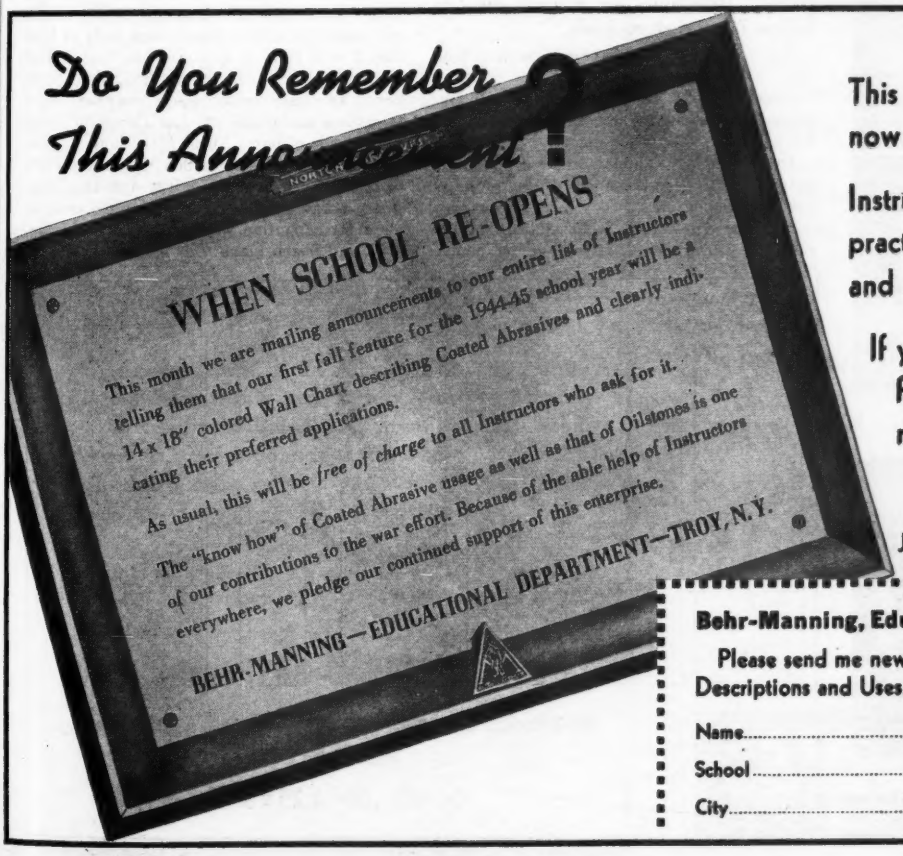
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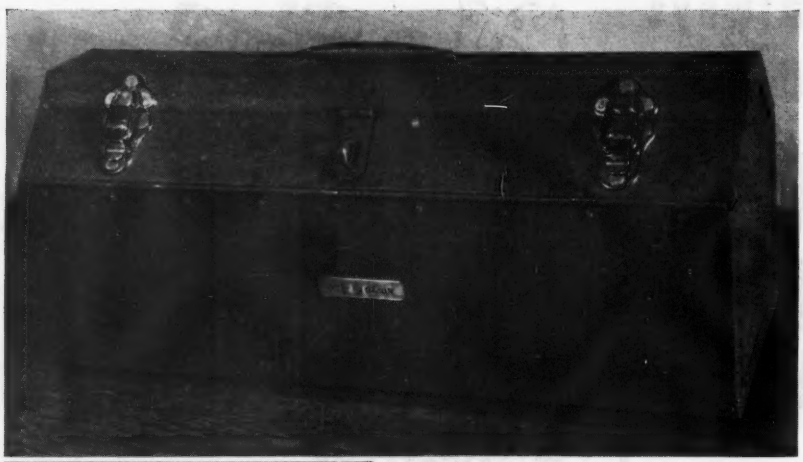
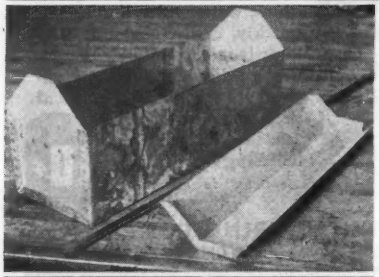
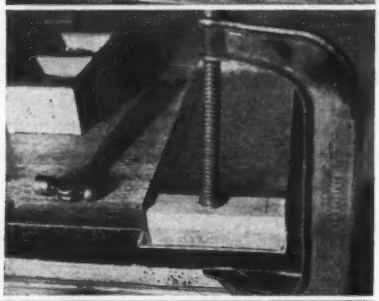
Sheetmetal Toolbox

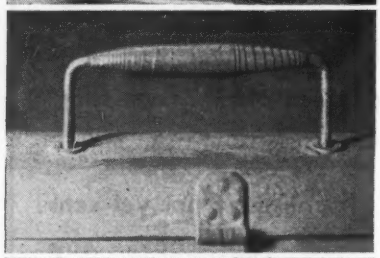
BY *Don L. Olson*

This professional appearing project is very popular in the author's classes at the Long Prairie, Minnesota, High School. The care given to the final finish is an important factor in the attractiveness of the project.









1. The completed box. 2. Box ready for hinges. 3. Method of bending up ends of tray. 4. Close-up of wrapped handle. 5. Box and tray in use.

THE toolbox described here has been used successfully in our tenth-grade classes in metalwork and also in the war-production training classes in the same subject. It meets many of the requirements for instruction in sheetmetal processing such as layout, bending, and riveting. The project is not difficult to construct and can be satisfactorily completed by most tenth graders. Adults usually take from 15 to 20 hours to complete it. The box, of course, is not an original idea but has been adapted from commercial boxes and boxes constructed in other school shops. Directions for making the box follow in worksheet form.

Job: To layout and make a sheetmetal toolbox.

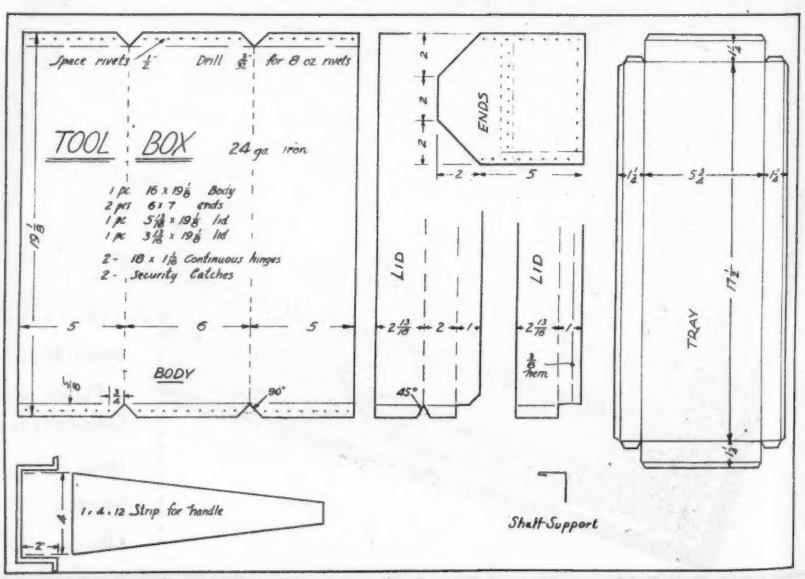
Materials: 24 gage sheet iron, continuous hinges, rivets, safety catches, hasp, 3/16" rod for handle.

Tools needed: Tinner's rule, combination square, scriber, center punch, drills, tin snips, hammer, mallet, etc.

Procedure for body: 1. Layout and cut according to drawing. 2. Layout, center punch, and drill holes 3/64" for rivets. 3. Brake up the ends of box to right angles 5/8" from each end. 4. Brake sides up by any convenient method.

Procedure for ends: 1. Layout and cut ends to shape. Round bottom corners slightly to fit bend of body of box. 2. Place one end in position and check for squareness. 3. Locate and mark for one or two holes; punch and drill. 4. Replace the same end, place rivet through holes and flatten. 5. Place a back-up block behind end and drill several other scattered holes. Rivet these. Heads should be on the outside. Use a 1/4" electric hand drill if available. 6. Finish drilling and riveting first end. 7. Same procedure for the opposite end. 8. Layout, cut, and bend shelf supports. 9. Center punch, drill. 10. Locate holes in ends for shelf support. 11. Center punch, drill, and rivet supports in place.

Procedure for lids: 1. Layout and cut according to drawing. 2. Brake sides of lids first. Note ends are bent up 9/16", which will make lid slightly longer than body of box. Check with body of box after the first end of lid is bent up. 3. Bend 45° along lines to fit box. You may solder where the ends meet to make a neater job. 4. Cut a piece of hinge to fit inside of box. About 17½" long. 5. Locate and drill holes along this hinge every 1½". 6. If you use a 12-oz. rivet for fastening, select a drill slightly larger than the rivet to allow for expansion when heading. 7. Locate, drill, and fasten hinge to box. Be careful not



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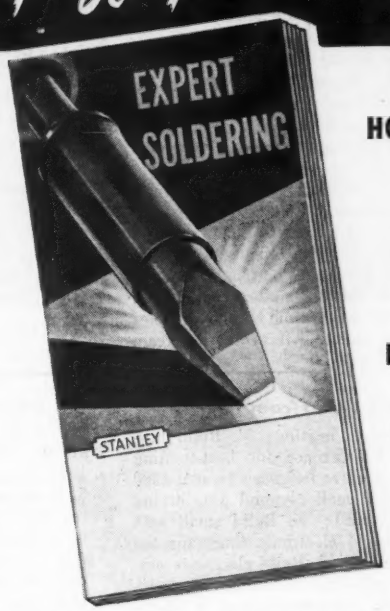

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to hit the rivets too hard when heading or a buckle will develop which may be hard to remove later. 8. Proceed in same manner for front lid of box. 9. Locate position for safety catches. Affix. 10. Hasp may also be fastened at this time or holes may be located for catches and hasp and then they may be fastened to the box after painting.

Procedure for the tray: 1. Layout lines for the tray, checking dimensions against inside of box to assure proper fit. A lighter gauge metal may be used for the tray. Twenty-eight or 30 gauge is recommended. 2. Cut accurately to layout lines. 3. Make a ¼" hem on sides and ends. 4. Brake sides up first. 5. Brake ends next. 6. Fold over tabs, center punch, drill, and rivet. 7. Layout, cut, and bend partitions to suit individual needs. 8. Fasten partitions in place.

Procedure for handle: Choice of handles is optional, but the following is suggested: 1. Measure and cut a piece of 3/16" mild steel, 9" long. 2. Bend as indicated in drawing, all except the last right angle bend, which must be bent after insertion in the lid. 3. Layout and cut piece of light gauge metal as indicated in the drawing, about 1" x 4" x 12". 4. Solder largest end to center of handle. Wrap tightly and solder the end. If necessary, trim so the joint will be on the bottom. 5. Locate holes in center of lid for handle. Drill 7/32". 6. Solder a 3/16" washer on bottom of holes in lid for reinforcement. After soldering, ream out to 7/32". 7. Place handle through lid and bend at right angle. If this end is heated red hot, it will bend much easier. In place of the right-angle bends, a washer may be welded to the ends projecting through the lid, or they may be threaded for a 3/16" burr.

Painting: If galvanized iron is used in the construction of the box, the entire box must be pickled in the following solution:

4 oz. copper sulphate
4 oz. hydrochloric acid
1 gal. hot water*

Brush on, let dry, and rub with steel wool. Brush carefully and then it is ready for painting. 1. Spray with a crystalline wrinkle finish paint. 2. Air dry for about three-quarters of an hour. 3. Bake in an oven for about an hour at 125°. Too much heat will cause the paint to turn brown. We used an old kerosene stove oven for the job which worked fine. Other paints can be applied, using a good metal-finish enamel.

Source of materials:

Continuous hinges—G. P. Derickson, Wholesale Cabinet Furniture, 1115 Hennepin Ave., Minneapolis, Minnesota.

Safety catches and hasps—The Brainerd Manufacturing Co., East Rochester, New York.

Crystalline baking enamel—Acme Paint Co., Local dealer.

*From *Principles of Paint Shop Practice* by Ralph Waring.

Electronics . . . (from page 12)

magnetism due to heating; 34. Build low-power induction furnace for heat-treating small objects such as lockwashers, etc. (500 kc.); 35. Build small plywood glue drying unit (Freq. 8 mc.); 36. Build small spot welder; 37. Build electronic timer for the small spot welder; 38. Build electronic current (heat) control for the small spot welder; 39. Check characteristics of a photo-electric cell; 40. Build photo-electric counter.

Instruction Outline
(Things to Know)

The following material may be taught as isolated units, but it is suggested that it be integrated, feeding in the mathematics a little at a time as it becomes obviously necessary to have it.

Part I. Mathematics Review: 1. Algebra: (*a*) literal numbers; (*b*) addition, subtraction, multiplication, division; (*c*) exponents and radicals; (*d*) logarithms, the slide rule. 2. Trigonometry: (*a*) angles; (*b*) sine, cosine, tangent; (*c*) use of trigonometric tables; (*d*) solution of right triangle. 3. Elementary plane vectors: (*a*) definition; (*b*) rectangular from A jB; (*c*) addition and subtraction; (*d*) conversion to polar form; (*e*) multiplication and division; (*f*) use of slide rule for conversion.

Part II. Electricity and Magnetism: 1. Electron theory of matter; 2. Direct-current electricity; 3. Ohm's law and Kirchhoff's laws; 4. Magnetism (statics); 5. Electrostatics and condensers; 6. Electromagnetism and induced currents; 7. Alternating currents: (*a*) Ohm's law for a-c circuits; (*b*) resonance. 8. Batteries and chemical effects of current: (*a*) difference between a cell and a battery; (*b*) dry cells; (*c*) storage batteries (lead-acid); (*d*) storage batteries (nickel-iron-alkaline). 9. Generators and motors, rotary converters: (*a*) alternators; (*b*) direct-current generators; (*c*) motors, d-c; (*d*) motors, a-c; (*e*) rotary converters.

Part IV. Vacuum Tubes (electron tubes): 1. Diode; 2. Triode; 3. Tetrode; 4. Pentode; 5. Beam-power tubes; 6. Multi-electrode and multi-unit tubes; 7. Voltage regulator tubes; 8. Grid controlled gas relay tubes; 9. Radio tube characteristics; 10. Static characteristics; 11. Dynamic characteristics; 12. Amplification factor; 13. Plate resistance; 14. Control grid-plate transconductance; 15. Conversion transconductance; 16. Maximum peak inverse voltage; 17. Maximum peak plate current; 18. Plate dissipation; 19. Screen dissipation; 20. Plate efficiency; 21. Power sensitivity; 22. Power output for triodes; 23. Power output for triodes in push-pull; 24. Power output for pentodes and beam-power tubes; 25. Tuning indicators, electron ray tubes; 26. Filament and heater power supply; 27. D-c filament or heater operation; 28. Filament or heater resistor; 29. A-c filament or heater operation; 30. Heater or cathode connection; 31. Plate voltage supply; 32. Grid voltage supply; 33. Duty cycle; 34. Cathode-ray; 35. X-ray; 36. Ignitron, thyratron, phototube, glow tube, phanotrons, pliotrons, and kenotrons.

Part V. Test Instruments: 1. Tangent galvanometer; 2. Arsonval meter movements (wall galvanometers and commercial d-c measuring instruments); 3. Direct-current ammeters; 4. Direct-current voltmeters; 5. Ohmmeter; 6. Alternating current instruments: (*a*) iron vane type; (*b*) Thompson inclined coil movements; (*c*) electrodynamometer; (*d*) d-c meters with rectifiers; (*e*) thermocouple instruments; 7. Wattmeters, electrodynamometers; 8. Commercial volt-ohm-milliammeters; 9. Wheatstone's bridge, a-c and d-c; 10. Tube tester and r-l-c bridge; 11. Vacuum-tube voltmeter; 12. Rider Volt Ohmyst and similar types; 13. Cathode-ray oscillograph; 14. Test oscillators for radio-frequencies; 15. Audio beat-frequency oscillators; 16. Audio-frequency measurement with oscillograph.

Part VI. Schematic Drawings and Parts Identification: 1. Radio circuit symbols; 2. Representation of wire connections and crossings; 3. Circuit sketching (The following exercises in circuit drawing are to familiarize you with standard methods of schematic representation and are not a theoretical study of the circuits involved): (*a*) full wave power supply with filter; (*b*) push-pull triodes transformer coupled; (*c*) pentode, single ended, resistance-capacity input with transformer output; (*d*) single-ended resistance coupled triode; (*e*) Hartley oscillator; (*f*) Colpitts oscillator; (*g*) Ultra-audion oscillator; (*h*) tuned-grid, tuned-plate, oscillator; (*i*) one-tube regenerative detector circuit; (*j*) superheterodyne circuit (simple, fundamental); (*k*) M.O.P.A. with plate neutralized single-ended final amplifier.

Part VII. Frequency and Wavelengths: 1. Speed of electric waves through space; 2. Relationship between wavelength and frequency; 3. Frequency to wavelength conversion factor; 4. Wavelength measurements with leacher wires; 5. Fundamentals, harmonics, and beat-notes; 6. National Bureau of Standards Radio Station WWV.

Part VIII. Power Supplies and Circuits: 1. Purpose in transmitter or receiver; 2. Alternating current: (*a*) half-wave and full-wave rectifiers; (*b*) bridge rectifiers; (*c*) voltage-doubler circuits; (*d*) mercury vapor rectifiers (ignitrons); (*e*) inverse peak voltage; (*f*) peak plate current; (*g*) power transformer requirements; (*h*) choke-input filter; (*i*) condenser-input filter; (*j*) swinging choke; (*k*) bleeder resistors; (*l*) voltage regulation; (*m*) "C" bias supplies; (*n*) voltage dividers; (*o*) line voltage adjustment; (*p*) 3-phase rectifiers, half-wave; (*q*) 6-phase rectifiers; (*r*) double 3-phase rectifiers. 3. Batteries; 4. Motor-generators and dynamotors; 5. Vibrators.

Part IX. Audio-Frequency Circuits: 1. Definition of audio-frequency; 2. Class "A" amplifiers; 3 Class "AB" amplifiers; 4. Class "B" amplifiers; 5. Transformer coupling; 6. "Impedance" coupling; 7. Resistance-capacity coupling; 8. Single-ended amplifiers; 9. Push-pull and push-push amplifiers; 10. Grid-bias for various classes of amplifiers.

Part X. Radio-Frequency Circuits: 1. Resonance; 2. Tuning condensers; 3. Tuning coils; 4. Frequency range of coils; 5. Radio-frequency transformers; 6. The vacuum tube as an r-f amplifier; 7. R-f amplifier interstage coupling; 8. Frequency spectrum for industrial applications; 9. Oscillators; 10. Self-excited oscillators; 11. Hartley oscillators; 12. Colpitts oscillators; 13. Tuned-grid, tuned-plate oscillators; 14. methods of obtaining feed-back; 15. Electron-coupled oscillators; 16. Crystal-controlled oscillators; 17. The oscillator in the receiver; 18. Mixer tubes; 19. Methods of mixing in the superheterodyne; 20. Electron-coupling in mixer tubes; 21. Relationship of oscillator frequency to signal frequency.

Part XI. Typical Receiver Circuits: 1. Crystal detector circuits; 2. Vacuum tube diode detectors; 3. Vacuum tube triode detectors; 4. Regenerative vacuum tube detectors; 5. Receivers with tuned radio-frequency amplifiers; 6. The superheterodyne receiver.

Part XII. Transmitting Circuits (Communica-

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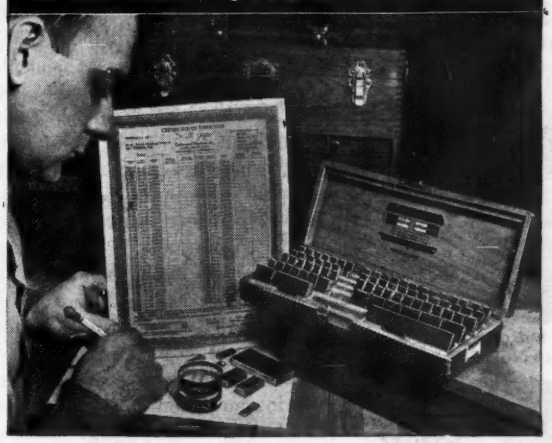

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Part XIII. Industrial Control Circuits: 1. Power contactor, ignitrons; 2. Timing, thyratrons; 3. Current (heat) control, ignitrons, and thyratrons; 4. Synchronous control; 5. Sequence timers; 6. Motor speed controls.

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(Continued on page 25)

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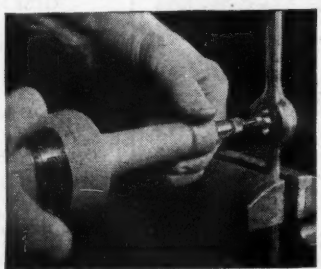

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WHAT'S DOING IN THE FIELD OF INDUSTRIAL EDUCATION

THE question of postwar compulsory military training was brought directly before the people recently when President Roosevelt advocated in a press conference that public opinion should be gradually formed on requiring a year's training, both military and civil, for youths between 17 and 23. The President indicated that he did not consider a year of service as compulsory military training as it might include some vocational work in addition to military subjects. He did not elaborate on how the vocational training to be given during this period would integrate with or supplant the vocational offerings of public schools. General George C. Marshall, shortly after the President's statement, also advocated a year of compulsory military training. Several bills are before Congress on the matter but it is believed generally that no action will be taken for several months. When it does come up, the issue will be a matter of hot debate. Recent polls of the public indicate a substantial majority in favor of some sort of compulsory military training. Whether this opinion will persist when the Nation is finally at peace is another matter, of course. A recent poll of members of the faculties of higher institutions indicates favorable opinion but with a strong dissenting minority. Another poll of junior-college leaders showed 57 percent in favor and 43 percent opposed but most of those in favor thought the issue should not be decided until after the war. The National Commission for the Defense of Democracy through Education of the National Education Association has issued a statement advocating no action until after the war and including the following: "If only a part of the vast expenditure required by the proposed compulsory military training were used for the improvement of our present educational program, it would be of greater value from a military standpoint and would be of far greater social and economic worth."

AMERICAN Education Week is being observed this year November 5-11. "Education for New Tasks" is the theme of this 24th annual observance which provides an opportunity to interpret to the public the role of the schools in the postwar years as well as their present con-

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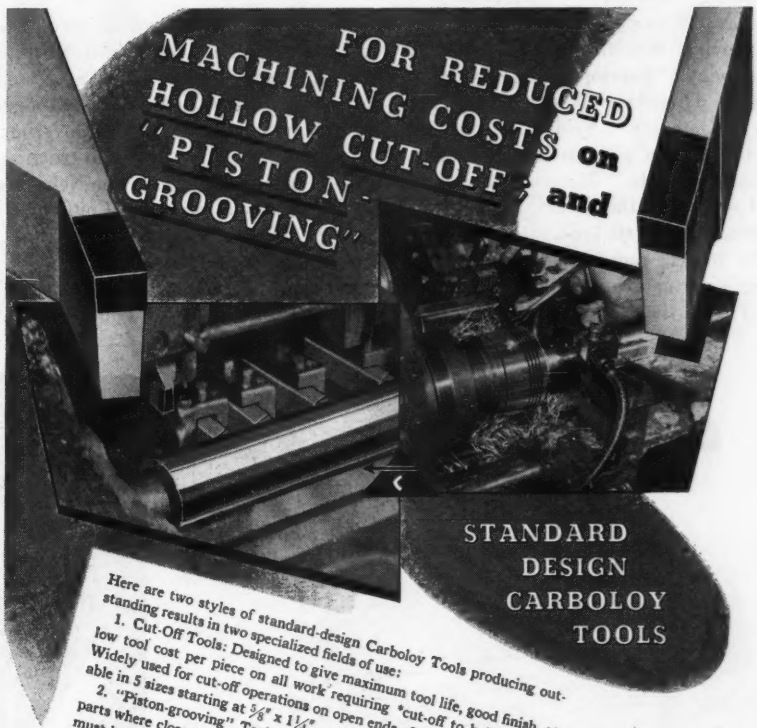

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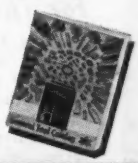

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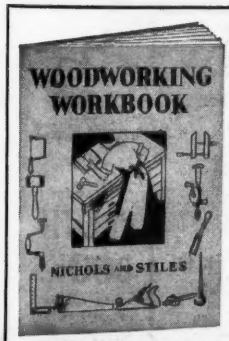

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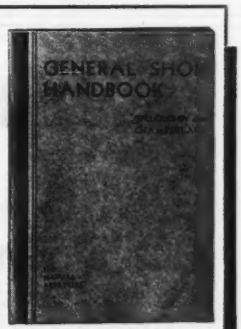

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Two state legislatures took action during the past legislative year in regard to vocational education. Nebraska created a three-man State Board of Vocational Education, consisting of the governor, the superintendent of public instruction, and the presiding judge of the Nebraska Workmen's Compensation Court. This replaces the former board. The new board will adopt policies to be followed in managing the State Trade School and administering vocational education and rehabilitation. The New Hampshire legislature evidenced interest in the expansion of vocational education in the state by authorizing the state board of education to increase the opportunities for vocational training by approving several schools as vocational training centers.

A STATEMENT was recently made by Colonel John N. Andrews, in charge of postwar planning for the National Selective Service System, that as a result of ex-servicemen seeking training, "The trade and vocational schools will probably be crowded.

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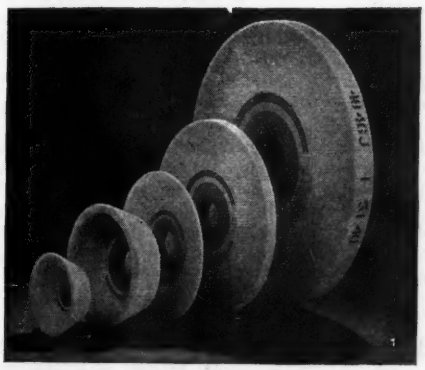

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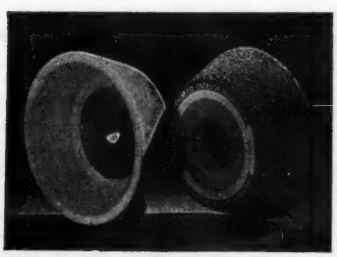

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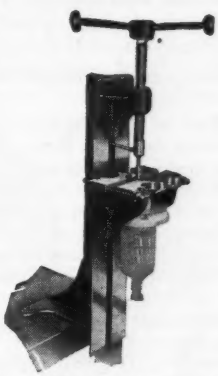

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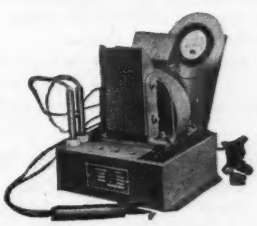

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BOOKS:

Basic Problems in Descriptive Geometry. Turner, Buck. New York: Ronald Press Co., 1944. Pp. xiii + 60. $1.75.

Based on third-angle projection, this concise series of work sheets in descriptive geometry is designed for use with any standard text which employs the direct or auxiliary plane method. Practical problems which apply theoretical principles have been used in the worksheets so that the principles involved may be studied and analyzed with the keener interest concurrent with recognized applicability. Suggestions to the student and working instructions for individual sheets are included. Sheets are punched for a three-ring notebook.

William Wirt Turner is Associate Professor and Head of the Department of Engineering Drawing and Carson P. Buck is Assistant Professor of Engineering Drawing, both at the University of Notre Dame.

Ferrous Metallurgy—Vols. I and II. Teichert. New York: McGraw-Hill Book Co., 1944 (2nd edition). Pp. x + 484 and xii + 487. $4.00 each.

Part of *The Pennsylvania State College Mineral Industries Series,* these two volumes are designed for use in the first two years of a three-year course of training for people interested in the iron and steel industry. The primary processing of iron ore in the blast furnace and the manufacture of cast iron, wrought iron, and crucible steel are covered in the first volume; the common methods of manufacturing and processing steel, including its primary fabrication, are discussed in volume two. Technical explanations are given as clearly and concisely as possible; an understanding of both chemistry and physics is necessary for many sections of the book, which is designed primarily for college and advanced technical school classes.

Ernest J. Teichert is Supervisor of Metallurgy Extension, The Pennsylvania State College, and Metallurgist for E. G. Budd Mfg. Co.

Basic Mathematics for War and Industry. Daus, Gleason, Whyburn. New York: The Macmillan Co., 1944. Pp. xi + 277. $2.00.

Written to set forth in a single text the principles of mathematics needed for the armed services, for war industry, and for ordinary civilian activities, this book includes carefully selected, well coordinated, standard material in arithmetic, algebra, geometry, and trigonometry. In each section, explanation of the fundamentals involved is followed by examples and a series of exercises, with answers given at the back of the book. Log tables, a protractor, and an index are also included.

Paul H. Daus and William M. Whyburn are professors of mathematics at the University of California in Los Angeles, while John M. Gleason is an assistant professor of mathematics at San Diego State College, Calif.

Refrigeration Service Manual. Manly. Chicago: Frederick J. Drake & Co., 1944. Pp. 301. $2.00.

Primarily an instruction book on accepted methods of servicing and repairing electric refrigerators and refrigeration systems, this manual contains six chapters on the construction and operation of complete systems and their parts, while the remaining nine chapters are devoted to information and detailed instructions on installation, testing, trouble shooting, adjustment, removal, replacement, and repair. Domestic and commercial types of refrigeration and air conditioning systems are fully discussed.

Aircraft Mechanics Handbook. Van Winkle (Editor). Peoria, Ill.: Manual Arts Press, 1944. Pp. 396. $2.75.

A compact manual of information necessary to aircraft mechanics, this book contains sections on riveting and welding; bending data; aircraft nomenclature, drafting terms, and symbols; steels and aluminum; aircraft woodwork, cable and splicing; fabric work; plastics; protective coatings for aircraft, etc. Army-Navy commercial standards are given, compiled as of spring, 1944. More than 280 drawings. Index. Cloth bound.

You Can Make It. Newkirk, Zutter. Chicago: Silver Burdett Co., 1944. Pp. x + 214. $3.00.

A book of things to do with scissors and paste for elementary school classes in arts and crafts, six sections are included: personal adornments, toys and games, gifts and decorations for special occasions, projects for school and home, projects for the library and study, and materials, tools, and processes. The book is well illustrated and printed in large type for easy reading and application.

Louis V. Newkirk is Director of the Bureau of Industrial Arts Education, Chicago Public Schools, and LaVada Zutter is a commercial illustrator and former teacher of arts and crafts in the Chicago Public Schools.

Pictorial Guide to Machine Shop Practice. Grisbrook, Phillipson. New York: Emerson Books, Inc., 1944. Pp. 91. $1.50.

Basic principles of machine-shop practice are set forth in this book by means of a series of drawings illustrating the right and the wrong way of performing each operation. Captions under the illustrations form a concise text. Sections are included on cleanliness and the handling of the machine, on fitting, turning, drilling, and milling. The book emphasizes the theory that the student should think first on the matter put before him, then observe the actions and reactions of the various points, and finally think again before forming any definite conclusions.

PAMPHLETS:

Fundamentals of Military Map Reading is an illustrated booklet intended as a teaching guide for preinduction training courses in the subject. The booklet is divided into three sections: the first gives an explanatory introduction to map study and a short statement of the varied military uses of maps; the second illustrates the training needs of the Army in map reading and map making in terms of what every soldier should know; and the third part discusses specialized skills in map and aerial photograph reading. The material in the booklet could be made part of drafting courses. Recent reports from abroad of a marked deficiency in map-reading skill among the troops led to the inclusion of the course in preinduction training and the preparation of the booklet by the Military Training Division of the Army Service Forces. Write for PIT Bulletin 401 to the Publications Branch, Bureau of Public Relations, War Department, Washington 25, D. C.

Shipyard Diary of a Woman Welder. Clawson. New York: Penguin Books, 1944. Pp. 181. 25c. A pocket-size book giving the day-by-day account of the experiences of a woman welder, this amusingly written diary is packed with interesting and valuable information—helpful not only to the beginning welder but to her instructor as well. When statistics showed that an unusually large number of women left work shortly after entering employment in shipyards, a study of the situation was made. Agnes Clawson, special agent of the U.S. Office of Education's Vocational Division, was chosen to go through the regular routine of training and into employment to determine exactly how the training was being done and how it might be improved. Results of the study were well worthwhile and the book provides an interesting comment on the industrial, social, and economic life of the woman shipyard welder.

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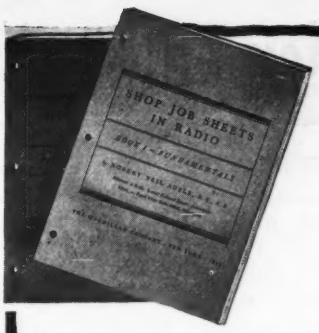

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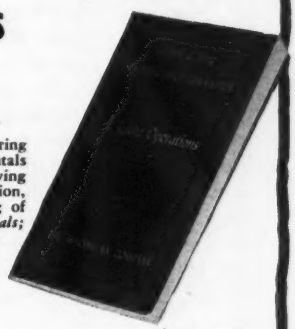

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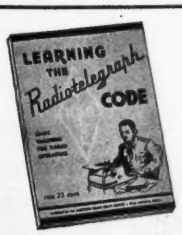

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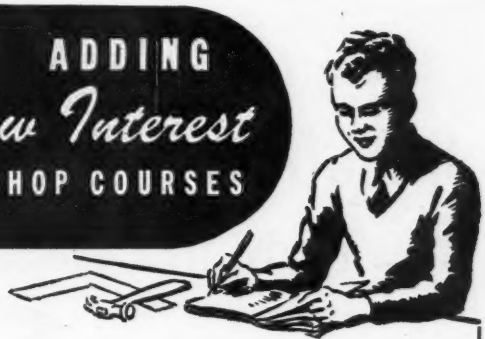

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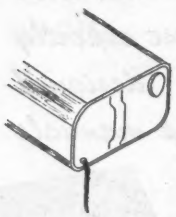

In shops where varnish is not used very rapidly some of it can be saved by punching a ¼" hole in the end opposite the pouring spout and using this hole instead of the spout to obtain varnish. The sides of the can should be compressed by the hands when pouring. By this method the can may be drained clean and the accumulation of hardened varnish that usually collects in the bottom of it eliminated. A wood plug will effectively seal the hole when not in use. —*C. H. Thompson, Woodworking Instructor, Latrobe High School, Latrobe, Pa.*

FILMS TEST STUDENTS

A test of the student's learning from slide films developed by the Jam Handy Organization Eye School, Detroit, uses the strip film itself. Portions of the picture and words, phrases, or complete sentences can be blocked out of the slide-film, then shown to the class. The student is confronted with the original conditions of a previous showing and with the task of supplying the missing words, constructions, and other factors that the instructor has "blacked out." For the blackout, make a paste of lamp black and water and apply it to the glossy side of the film with a small art brush. This makes the film opaque wherever spread and can be quickly removed with a slightly dampened cloth or by merely rubbing the thumb across the film. A mimeoscope provides just the right illumination for preparing the film, or a light bulb, placed in a shallow box with a frosted glass top, will serve the purpose.—*Roger Zinn, The Jam Handy Organization, Detroit.*

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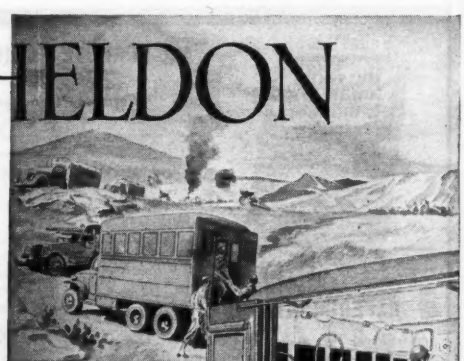

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Electronics . . . *from page 18*

Fink, D. G. *Engineering Electronics.* New York: McGraw-Hill Book Company, Inc., 1938.

Eastman, A. V. *Fundamentals of Vacuum Tubes.* New York: McGraw-Hill Book Company, Inc., 1937.

Saunders, F. A. *A Survey of Physics* (revised edition, Chaps. 19 through 29). New York: Henry Holt and Company, 1936.

Part II. Manufacturer's Descriptive Booklets

Westinghouse Electric and Manufacturing Company, East Pittsburgh, Penna. (Four well illustrated booklets): *The ABC of Electronics at Work, Electronics at Work, Ignition Rectifiers, Facts about Westinghouse Electronic Control.*

How Electronic Tubes Work. General Electric Company, Electronics Department, Schenectady, N. Y.

Electronics in Industry. Radio Corporation of America, R.C.A. Victor Division, Camden, N. J.

Part III. Periodicals:

Job Titles and Specifications. (2 mimeo. sheets) The University of the State of New York. State Department of Education, Albany 1, N. Y., Aug., 1944.

Gillespi, H. C. "Surface Hardening of Metals," *Electronics,* July, 1944, p. 102.

Jordan, J. P. "Design of Electronic Heaters for Induction Heating," *Proceedings of the Institute of Radio Engineers,* Aug., 1944, p. 449.

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Taylor, J. P. "Fabricating Wood Aircraft 'Skins'," *Electronics,* Apr., 1944, p. 102.

"R-F Heating of Aircraft Spars and Gas Tanks," *Electronics,* Feb., 1944, p. 150.

Taylor, J. P. "High-Speed Soldering with Radio-Frequency Power," *Electronics,* Feb., 1944, p. 114.

Sherman, V. W. "Electronic Dehydration of Foods," *Electronics,* Feb., 1944, p. 94.

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"Basic Electronic Circuits and Tubes," *Production Engineering,* Jan., 1944 (a reprint available from Westinghouse Electric and Manufacturing Company, East Pittsburgh, Penna.).

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Moyer, E. E. "Electronic Control of D-C Motors," *Electronics,* Sept., 1943, p. 133.

Taylor, J. P. "R-F Heating Speeds Plastic Molding," *Electronics,* Sept., 1943, p. 102.

Gray, T. S., and H. R. Frazier. "Electronic Applications," *Electronics,* Oct., 1943, p. 122.

"Work Coils for High-Frequency Heating," *Electronics,* Oct., 1943, p. 112.

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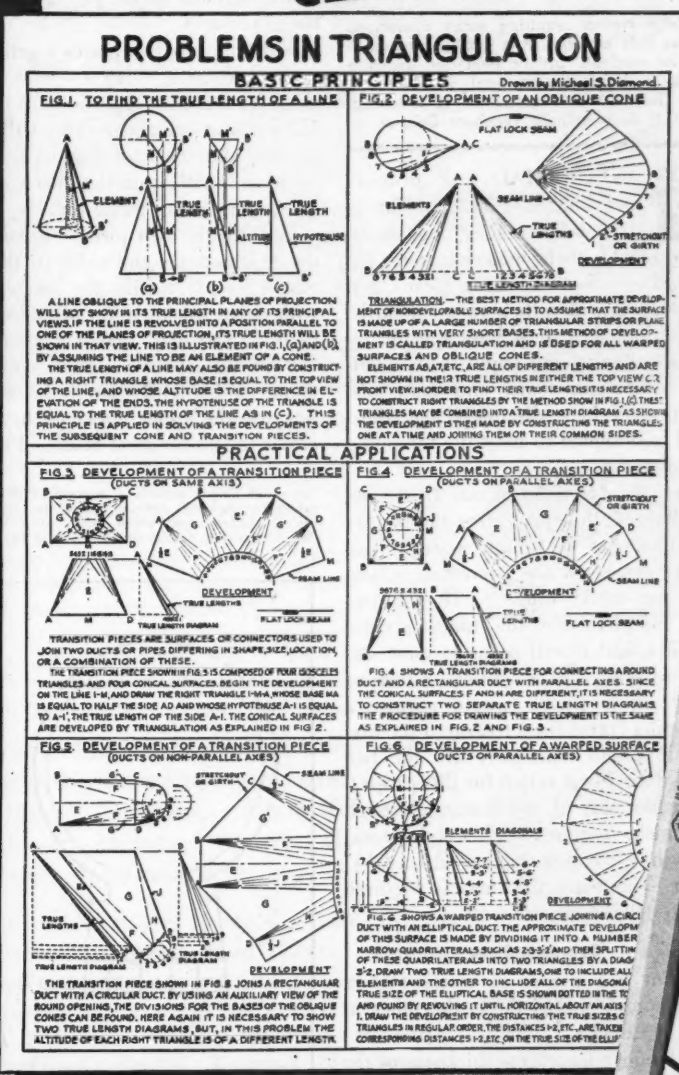
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BASIC PRINCIPLES
Drawn by Michael S. Diamond
FIG. 1. TO FIND THE TRUE LENGTH OF A LINE
FIG. 2. DEVELOPMENT OF AN OBLIQUE CONE
PRACTICAL APPLICATIONS
FIG. 3. DEVELOPMENT OF A TRANSITION PIECE (DUCTS ON SAME AXIS)
FIG. 4. DEVELOPMENT OF A TRANSITION PIECE (DUCTS ON PARALLEL AXES)
FIG. 5. DEVELOPMENT OF A TRANSITION PIECE (DUCTS ON NON-PARALLEL AXES)
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Try This Wartime Shop Project

BY *Walter B. Weber*

Here is a project requiring many operations yet uses little material. It is flexible enough to draw out students' artistic bent and exacting enough to teach fundamental woodworking skills. The author is instructor of industrial arts at Buffalo State Teachers College.

TESTED INSTRUCTIONAL PROJECT

INDUSTRIAL arts projects are difficult to design. This is true because they must motivate students, their materials must be within the students' financial means, and they must be within their range of skills. In addition, they must have specific instructional value and require only available equipment, tools, and materials. The project here discussed and illustrated is designed to meet the foregoing requirements.

This portable wood picture frame can be collapsed, thus protecting the picture from damage. Its unique wood hinges, easy to construct, are interesting substitutes for metal hinges. The project when complete gives the student a sense of pride, and it will occur to most students to send it to a soldier brother or friend whose travels would require a protecting frame for a treasured picture.

Walnut and mahogany are the two woods found best suited for this project. The main part of the frame, although ½" thick, requires ¾" rough stock, while the $\frac{5}{16}$" cover requires at least ½" stock. This extra thickness is required to allow the hinge to be offset.

Operation Steps

1. Cut two pieces of wood 4¼" x 3¼", one piece ¾" thick, the other at least ½" thick.

2. Remove the excess thickness of the stock by using a band or circular saw while the material has straight sides. (If no power machinery is available, a back saw may be used.) Care should be exercised not to cut into the hinge part at the end of the pieces.

3. Layout the center hole for the picture opening. Drill a ⅛" hole ⅜" deep at the compass point of the inside circular picture area. Set the cutter of the tool shown to $1\frac{5}{16}$" and cut a circular slot ¼" deep and 2⅝" in diameter. Use a wood chisel to remove the wood inside of the circle.

4. Draw the design on the inside surface of the two pieces and cut out on a band or jig saw. Do not undercut the lines for the hinges, since the two pieces should fit snugly at the hinge point.

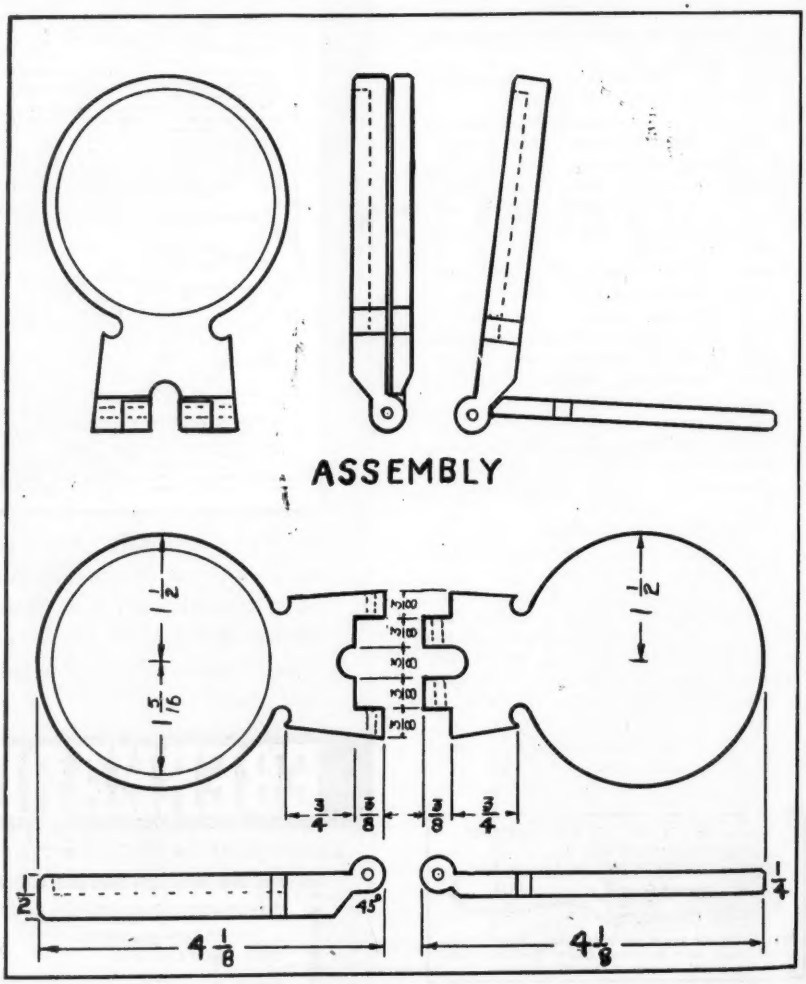
5. Smooth with sand paper the two inside surfaces of the pieces and fit the hinge surfaces.

6. Clamp the two pieces together in a vertical position, using a square on both sides for this purpose, and drill the four ⅛" holes at one time. This will insure correct alignment of the hinges. Remove the drill from the chuck and use it as a temporary hinge pin.

7. With the two pieces closed, finish the top, bottom, and sides so that they match evenly. File the hinge round with equal thickness on all sides of the drill. (The drill makes a good guide for this purpose.) Disassemble the frame and slightly bevel the edges to improve the appearance and to make it easier to rub the final finish. Finish all surfaces with fine sand paper.

8. Cut two pieces of ⅛" dowel ¾" long. Sand one-half of each piece slightly so that they will fit snugly in

The wood hinges provide a number of interesting but not too difficult operations. Note the protective cover which serves as a base when in use. The details below are easy to follow.



the 1/8" hole. Place some glue on the unsanded end, assemble the frame, and force the two bearing pins into the hinge holes with the sanded end entering first. This prevents the hinge from being glued together.

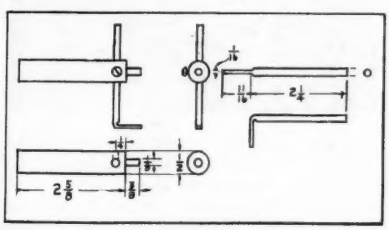
9. Stain, fill, and shellac or lacquer the frame. Each coat of finish should be rubbed until a fine finish is obtained. If white pine is used, attractive color paints and transfers could be used for the finish.

10. Cut the photograph to 2 5/8" in diameter and glue it into the frame.

The writer recommends this project as highly instructional. It will interest the student and his family. Its practical and decorative possibilities will appeal to most students. The project is flexible enough to allow play for any artistic taste and originality the student may have. It lends itself to inlay or chip carving. It is flexible also as to size and as to the woods that can be used. The hinge idea is both economical and suggestive for other uses, and considerable value is added to the finished product by the student's own handicraft. It employs many operations and yet consumes very little material.

You Can Make Your Own Cutter

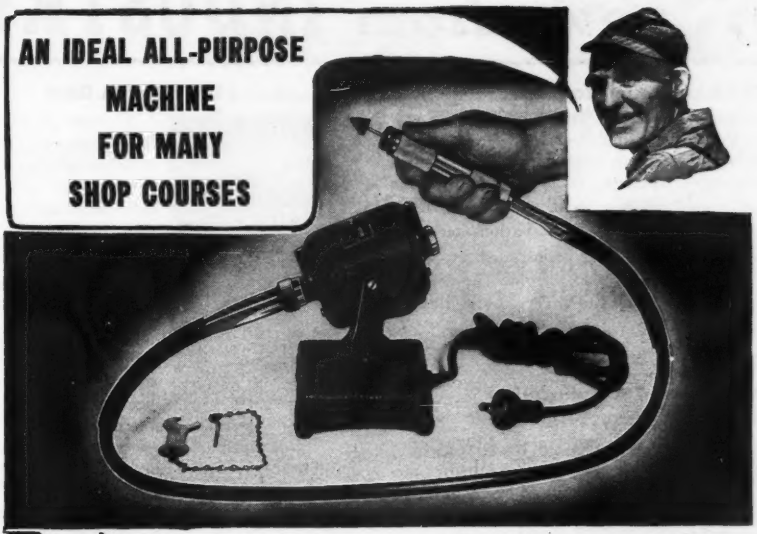
A number of types of cutters can be purchased for cutting out the circular area, but the tool here described can be made very easily.



The holder is made of 1/2" metal rod; C.R. steel is preferred. Cut a piece 3" long, place it in a lathe chuck and turn a shoulder on one end 3/8" long and 1/8" in diameter. If a lathe is not available, scribe a center on one end of the stock and center punch at cross lines. Clamp the stock in a vertical position and drill a 1/8" hole in that end.

Cut a short piece of 1/8" rod and force same into the hole. Drill a 1/8" hole through the center 1/4" from the end. Drill a No. 33 hole 90° from this hole and tap for 6 x 32 set screw.

Take a piece of 1/8" drill rod or steel wire, file one side flat, file cutter end, and bend as shown. Harden and draw a straw colored temper on the cutter end. Assemble the cutter.



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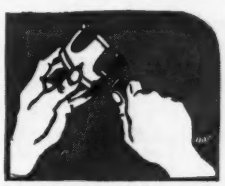
In die and tool departments, for grinding, finishing and touching up dies, molds, jigs, etc.

Among the many types of shop courses where Foredoms find their rightful place are: *Machine Shop Practice, Automotive Mechanics, Aircraft Mechanics, Plastics, Tool and Die Making, Electrical, Radio, Dental Mechanics, Jewelry & Watchmaking, Model-Making, Woodcraft, etc.*



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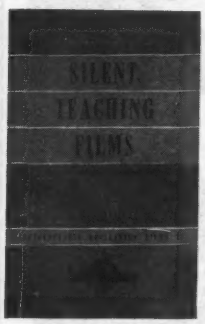
Flexible Shaft Machines

Foredom Electric Company announces a new brochure illustrating their four series of flexible shaft machines, useful for finishing small stampings, forgings, etc., for identification marking, in tool, die, mold, and pattern shops, and in the field of plastics. Various accessory sets, mounted abrasive points, brushes, steel burrs and cutters, and polishing supplies are also illustrated. Write the Foredom Electric Company, 27 Park Place, New York 7, N.Y., *or check number 12 below.*

Encyclopaedia Britannica Silent Teaching Films



Silent teaching films, originally produced by Eastman Kodak Company and recently turned over to Encyclopaedia Britannica Films, Inc., are fully described in their new catalog. Films on physics, meteorology, elementary and general science, aeronautics, preinduction training, industrial arts, and vocations are listed. A handy chart at the back of the catalog delineates the utilization scope of each film. For your copy write Encyclopaedia Britannica Films, Inc., 1841 Broadway, New York 23, N. Y., *or check number 13 below.*

Pittsburgh Plate Glass Company Announces New Booklet

Color Dynamics is a new booklet put out by the Pittsburgh Plate Glass Company explaining the utilization of color energy to promote efficiency in industrial work. Their system of applied color is designed to eliminate eye fatigue, speed up production, improve the quality of the work, and increase the safety of the worker. A detailed study of the causes of eye fatigue has been made and entirely new methods for painting machines are described in the book. The part color plays as background on walls, ceilings, and floors is also dealt with. For your copy of this informative booklet write the Pittsburgh Plate Glass Company, Paint Division, Dept. SS-10, Pittsburgh 22, Pa., or *check number 14 below.*

Each item listed above is numbered. Check the numbers of the items you want, and mail the coupon, properly filled in, to . . .

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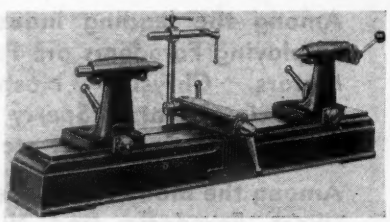
Cascophen Liquid Resin Glue

A new synthetic resin glue which sets at ordinary room temperature and requires only moderate pressure for bonding is now available from Casein Company of America. The glue can be stored for an indefinite period of time at room temperature, is waterproof, heat- and mold-proof. Relatively expensive at present *Cascophen RS-216* is recommended for work where complete durability is required and where joints can not be heated, such as the gluing of thick laminations for airplane propellers, heavy-duty built-up arches and beams, aircraft spars and assemblies, etc. For directions on use and further information on the glue write for Service Bulletin No. 20 to Casein Company of America, 350 Madison Ave., New York 17, N. Y., *or check number 15 below.*

Delta-Milwaukee Bench Center

To help meet the need for accurate and easily operated inspection and testing devices Delta Mfg. Co. of Milwaukee announces a new bench center. Distinctive features of the unit are the flat top surface; the operation of the indicator support bracket, which has a base that can be firmly and quickly locked in any

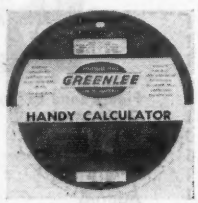


position on the bed by merely operating a handle in front; and interchangeability of head and tail stocks to permit operation of the unit from either side. For complete data write the Delta Mfg. Co., 673 E. Vienna Ave., Milwaukee 1, Wis., *or check number 16 below.*

New Greenlee Calculator Solves Woodworking Problems

An exclusive new "Handy Calculator" is now available to all workers with wood through a special wartime offer by the makers of the Greenlee line of registered tools for craftsmen.

The calculator is packed with valuable information and is easily operated: by merely adjusting the dial you can convert linear to board feet; determine slope per foot in degrees; find comparative hardness, weights, shrinkage, warping, and ease of working of various woods. Bit sizes for head, body and thread of standard screws, nail specifications, tips on tool sharpening are also included on this Calculator, which is an accurate protractor as well.

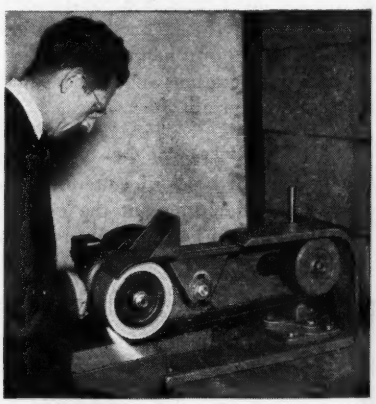


Constructed of heavy varnished cardboard and soilproof, this tool is 6″ in diameter and will easily fit into a tool kit. As long as the supply lasts, a Handy Calculator may be obtained for 10c by writing direct to Greenlee Tool Co., Rockford, Ill., or by checking number *17 at left and enclosing 10c in coin.*

Portable Electric Tool

H & H Research Company announce a new push-and-pull action portable electric tool, designed for use in filing, burring, and chamfering; honing; polishing and lapping; scraping, sawing, and sanding. Several new and improved features are incorporated into the tool, two models of which are available. Total weight is just 5 pounds. For full information write the H & H Research Co., 415 Marquette Bldg., Detroit, Mich., *or check number 18 below.*

Bench-Type Belt Grinder



Ideally suited for burring gears, weld grinding, generating radii, removing flash, flat and edge work, cleaning up and polishing is the new bench-type abrasive belt grinder designed by Porter-Cable Machine Company. Available with or without a motor, the grinder unit uses an endless metal-cutting abrasive belt 2½″ wide and 60″ long. The design provides a flat-bed grinding area as well as a soft resilient contact wheel which is adaptable for grinding all types of metal. For further information write the Porter-Cable Machine Company, Syracuse 8, N. Y., *or check number 19 below.*

New Literature . . .

Precision Equipment for toolroom and machine shop is illustrated and described in Challenge's new catalog No. 836. Surface plates, reading and turn tables, work benches, and lapping plates are listed. Challenge Machinery Co., Grand Haven, Mich., *or check number 20 below.*

High-Speed Steel. Jessup Mustang High Speed Steel and its uses fully described with recommendations for most efficient application. Catalog. Jessup Steel Co., Washington, Pa., *or check number 21 below.*

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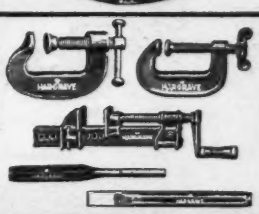

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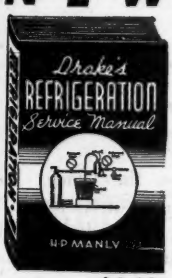

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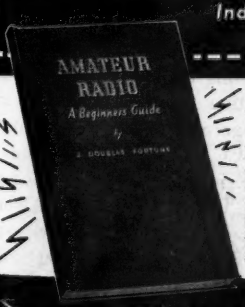

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THIS book teaches the basic principles of machines. It is a text, laboratory manual and notebook combined. It shows important industrial applications of machines. Gives essential theories, experiments, demonstrations. Space is provided throughout the book for recording results of experiments. Vocabulary lists follow several of the units to aid the student in mastering new and difficult words. The material is organized on the unit plan with page references given to many standard texts. Assignment units instruct students in the proper procedure for each job encountered. Many questions are used to direct attention to important facts. 320 pp., 281 illustrations. $2.50. *Cornetet & Fox.* This is a companion volume to "Principles of Electricity" and "Methods of Measurement."

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ABOUT YOUR FELLOW TEACHERS

DR. ROBERT L. COOLEY, founder of the Milwaukee Vocational School in Milwaukee, Wis., and its director until ill health forced him to resign the position in 1940, died May 19, 1944, at the age of 75. Dr. Cooley served as president of the American Vocational Association in 1928-1929 and as president of the Wisconsin Teachers' Association in 1928 . . . R. W. E. BOWERS, for the past two years an instructor in industrial arts at Louisiana State University, has accepted the position of assistant supervisor of trade and industrial education in the special field of industrial arts for the State of Louisiana. . . . WALTER E. RUPP has been appointed director of industrial arts at the Austin, Minn., High School, leaving the Woodward High School in Cincinnati, Ohio, where he has been instructor of printing for the last four years. . . . RUSSELL K. BRITTON, teacher trainer in trade and industrial education at Colorado State College in Ft. Collins, has accepted the position of director of vocational education in the Denver, Colorado, public schools. . . . ALDEN E. DINSMORE is now printing instructor at High School East, Wichita, Kans., replacing CARL E. BRUNER. . . . JOHN GRIBBLE replaces ELMER E. MILLER as machine-shop instructor in Ironwood, Mich. . . . KARL J. SEITZ has replaced JOHN BURKE, who is now in the Army, as instructor in metal shop and aviation mechanics at the Great Neck, N.Y. High School. . . . PHILLIP PERRY has retired from his position as instructor of industrial arts in the Weston, Mass., High School. BURNHAM G. GAGE has replaced him. . . . Transferring from the Machine and Metal Trades High School to the Long Island City High School is JACOB R. GRATHWOHL. . . . A. J. SMITH has replaced R. D. WEST as director of manual training in the Menominee, Mich., High School. . . . J. F. DONOVAN, formerly director of vocational education in the Canton, North Carolina, High School, has accepted the position of training officer with the U.S. Veterans Administration in Fayetteville, N. C. . . . Leaving for the armed forces from the Jeffersonville, Ind., public schools are the following three men: ELMER H. BEYL, GRAYDON M. CHAPPELLE, and MICHAEL J. BREEN. . . . FRANK LUMPE has left the Kingsburg, Calif., Union High School to teach shopwork at the Union High School in Lower Lake, Calif.

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School architects, administrators and teachers, aware of postwar educational imperatives, are basing school building designs on tomorrow's needs. In planning special rooms and selecting vocational and laboratory equipment Sheldon can be of unusual assistance. Sheldon will also assist you in compiling budget estimates and writing specifications. Write today — request Sheldon Planning Assistance. Without obligating you in any way Sheldon Engineers will call and discuss your problems, ideas and plans.

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from Washington . . .

(from page 32)

ganize and strengthen the Office. It's really a three-year plan of action. If approved all 'round, every division of this Office will be infused with new life for postwar work."

At the U. S. Chamber of Commerce: "Yes, we're working on a series of charts which might prove that good education spells good business. We've found that wherever education is poor, business opportunities are weak; wherever education is good, business opportunities flourish."

At the Educational Policies Commission (NEA): "Those half-baked and partial solutions to the so-called youth problem floating around Washington are actually dangerous. Take that plan to revive the CCC, for example! That is why the EPC is coming out with a new book called "Education for *All* American Youth." You will agree when you see it that in our schemes vocational education is given a high place." (We've seen the book; and it does.)

Films . . . . . *(from page 7)*

Follow-up.—The follow-up is one of the most important steps in teaching with films. Most instructional films are excellent devices to promote discussion and the instructor must not fail to take advantage of this unusual opportunity for learning. The follow-up discussion may be promoted by leading questions pertaining to the key points of the film, or it may follow a brief objective quiz. The instructor must not misinterpret his role during the discussion. He is not an intellectual suction pump but rather a discussion leader, a player who keeps the ball of conversation rolling in the direction of the desired goal.

Repeat films as necessary.—Repeat showings of instructional films as frequently as seems appropriate. After seeing a film once and discussing it with the class, a learner may "see" more during a second showing of the film than during the first showing. Films to help teach specific skills can be shown to one group as many as three times: (1) to introduce the skill, (2) to help in mastering the skill, and (3) to review the operations. Do not hesitate to repeat films for instruction.

Encourage activity.—One outcome of a good instructional film ably presented is an eager desire on the part of the learners to "try their hand" at what they have just seen. If they have observed a skilled operator at work on a lathe, they are anxious to imitate just what they have seen. Impressions are most vivid soon after received. Don't handicap learning by delaying the opportunity for action.

One film at a time.—If an instructor does a thorough job of teaching with films it is unlikely there will ever be a need for more than one film during a class session. Instructors who are experienced in teaching with films prefer one with a showing time of approximately fifteen minutes. This length film allows time for the introduction, for the first showing, for discussion, and for repeated showing if necessary.

We can't have everything.—Let's assume some things. It's true the films don't tell all. An instructional film on lathe operation may show an operator receiving work that has been centered and drilled. The film has to begin somewhere and so we can assume the centering and drilling of the piece although the operations are not shown. The test of a film is the amount of information it conveys during the time it consumes.

Announcing a change of name!

Henceforth, the Lafayette Radio Corporation (Chicago and Atlanta) will be known as the

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The Lafayette Radio Corporation has, for 22 years, been one of the well-known names in radio and electronics. Our policies and our personnel, our reputation for integrity and outstanding service to our customers have enabled us to become one of the nation's great arsenals of radio and electronic equipment. In announcing the change of name to the *Concord Radio Corporation*, we emphasize that *the name only is affected.* To our thousands of customers, we promise a continuance and broadening of our organization and our policies. With the advent of new and greater horizons in electronics, the *Concord Radio Corporation*, will blaze new trails in engineering achievement and customer services. Watch for our future advertisements, and be sure that your name is on our list to receive postwar literature and catalogs.

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for 1943-1944

Write today for your free copy of SCHOOL SHOP'S index for the 1943-1944 school year, Volume III. All articles and projects which appeared in Volume III are listed, with the month and page number, both under the name of the author and according to the subject of the article.

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from WASHINGTON by MICHAEL PACA

"LET US say to these war workers: You have learned how to be a welder, you have learned how to be a mechanic, you have learned to build a ship, you have learned to build a tank. . . Now we want to teach you how to build radar for homes in days of peace. We want to teach you to build instruments for television. We want to teach you how to build more radios than we have ever had. We want to teach you how to build the best automobiles and the best airplanes. . . Why? In order that the man or woman, the boy or girl, may be taught skills which will enable them to make a decent living, to be better citizens, and to enrich the economy of this great country."

In these words Senator Pepper of Florida summarized—and argued for—those far-reaching provisions in the Kilgore-Murray Reconversion bill having to do with vocational training.

Under the terms of this bill, war workers would have been permitted to take free training for six months, plus a modest living allowance while in training.

The Senators, however, refused to see the rightful place vocational training has in reconversion; saw fit instead to pass a bill which merely authorized a Retraining Administration "to develop plans" for retraining. But even this provision was knocked out by the House in the version it approved. As this is being written, the House-Senate conferees are trying to agree on a reconversion bill whose principal theme seems to be not productivity but unemployment compensation.

Whatever bill the conferees agree on is likely to have little in it having to do with vocational training. But this, incidentally, does not displease too much the proponents of the George-Dondero bill, which expands and extends the regular programs of vocational education and authorizes area schools. They see in this set-back an enhanced opportunity to push through the languishing area schools bill early in 1945.

● No such silver lining can be seen in the defeat of the schools in the battle for surplus government property. A House, dominated by a "no-give-away" policy over-rode the Senate's first generous gesture to "donate" to schools and colleges usable supplies and equipment. This bill is still in conference; a slim hope exists that the schools' interest in surplus property may yet be recognized.

● There is more and more talk in Washington about the "forgotten area" or "no man's land" in education. People who use these terms refer to the area above secondary vocational education but below college grade work. In this area fall some 30 to 40 million wage-earners above the age of 18 with a keen appetite for part-time or supplementary schooling. Too old for secondary schools and not interested or not able to take educational college courses, these millions nevertheless want education and training.

Worried college presidents who come to Washington "to confer" about declining enrolments are not certain whether the universities ought "to reach down to serve these people"; traditional minded secondary-school administrators are not sure whether the high school ought to "reach up" to them. Meanwhile, these adults, now joined by the veterans, are knocking at the doors of both institutions asking for action.

It is against a background of such facts that the state directors for vocational education will read the full text of the report of the Consulting Committee on Vocational-Technical Training, which will reach them by the end of October. It has to do with a type of training which may well meet the needs of some of the people in the "forgotten area"; and will certainly meet the needs of industry. For, the Consulting Committee studied how to expand the training of less than college grade which has a vocational rather than professional objective but which emphasizes the development of technical competency rather than proficiency in skills.

At the same time, the Committee discovered that industry needs thousands of engineering and science aides, "limited technicians" and semitechnical men and women. The average ratio of technicians per engineer needed is more than 5 to 1. In some industries it runs as high as 20 to 1.

No new types of institutions, no new federal legislation, no new sums of money are recommended by the Consulting Committee. Instead, it recommends a series of actions which almost any community can undertake. It proposes utilizing T. and I. schools, technical institutes, ESMWT courses, correspondence study, and other existing courses. Above all, it urges local programs for vocational-technical education based on local needs.

● As your reporter made the rounds of Washington news sources, he heard these comments:

From a White House source: "The President's plan to require youth to give a year's service to their country is rapidly being completed. You know, of course, that while it isn't a military training program, military training will be part of it; and while it isn't a vocational training program, vocational training will be a part of it also."

At the U. S. Office of Education: "This thick book you see here is Commissioner Studebaker's plan to reor-

(Continued on page 30)

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THE NEW WIDE-SPACED HARD TOOTH SAW

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★ BRASS ★ COPPER ★ BRONZE
★ GRAY CAST IRON ★ PLASTICS ★ WOOD

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The DoALL Buttress does the work in a fraction of the former time and fits any band sawing machine.

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